Vol. XIV. May, 1898. No. 5.

PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

PUBLISHED BY
MUNICIPAL ENGINEERING COMPANY
INDIANAPOLIS NEW YORK

Two Dollars Per Year. Single Copies, 25 Cents.

ASPHALT PAVEMENTS

THE BARBER ASPHALT PAVING COMPANY

BOWLING GREEN BUILDING
11 BROADWAY, NEW YORK

Highest Awards
Received at
World's Fair, 1893.

1st—ASPHALT AND ASPHALTIC CEMENTS:

"The Refined Asphalt and Asphaltic Cements for Pavements and Asphaltic Mastics are of excellent quality and up to the required standard. They are therefore worthy of an award."

2d—TRINIDAD ASPHALT PAVEMENTS:

"The Trinidad Asphalt Pavements for streets, laid according to the several methods by 'The Barber Asphalt Paving Company' upon concrete foundations, old stone block and other pavements, are adapted to all climates. They are remarkable for quantity, quality, ease of traction, noiselessness, ease of cleaning, sanitary value, economy of maintenance and handsome appearance, and are worthy of an award."

3d—MACHINERY AND PROCESSES:

"The models, samples, etc., show clearly and fully the Machinery, Processes and Materials for the manufacture of Asphalt Pavements and Mastics. They are worthy of an award."

ASPHALT

Municipal Engineering

VOLUME XIV. MAY, EIGHTEEN NINETY-EIGHT. NUMBER 5.

MR. ROSEWATER'S RULES FOR CROWNING PAVED STREETS.

The following letter from Andrew Rosewater, city engineer of Omaha, gives the results of his practice in crowning paved streets. Observation of the completed streets shows that it is possible to secure the construction according to the rules he has formulated. The change in form of cross-section due to change in gradient, takes place in about the same distance that is occupied by the curve connecting the two intersecting gradient lines of the crown and is certainly made successfully. There does not seem to be as much difficulty in giving a smooth and workmanlike appearance to the street over the area on which the change in cross-section is gradually worked out as there is in making a good job on a large intersection of two streets, especially if the streets are not of the same width. This is true equally on asphalt, brick and stone streets. Mr. Rosewater's letter follows:

To the Editor of Municipal Engineering:

In reference to the formulae for street crowns, I see nothing incompatible in their application with good engineering practice. The differences in gradient of crowns upon intersecting and variable grades does not prevent the crown lines from connecting. All that is necessary is to extend the line of the crowns to points of intersection and then join them by a curve in the construction, as all streets should be to secure the best traffic results, especially where street railway lines cover the surface. In the repaving of a mile of one main street in Omaha with grade varying from 0.5 per cent. to 7 per cent. this practice has been followed with marked differences in comfort on street car traffic. Where formerly the passengers experienced sudden jolts on variable grade intersections, the change resulting from joining the intersecting lines by curves makes them unobservable to passengers within the car. I fully concur in the statement that for drainage purposes it often becomes necessary to deepen gutters in the centers of long flat blocks, but in such cases the crown can still be computed from the base of gutter and connected by intersecting and slightly curved connections or can be maintained as a straight line from end to end of block, by varying the cross-section to meet the slight variations of the gutters. These are, of course, exceptional cases and are subject to variable treatment depending on local conditions. I send you herewith a table of street crowns with formulae which varies slightly from former tables in that a fixed limit to depth

of gutters on all grades is determined.

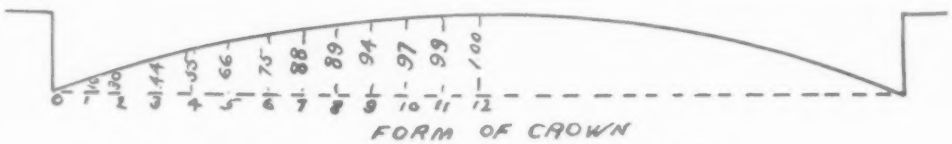
The object of limiting crowns on steep grades, criticised by some of your correspondents, seems to me so manifest as to scarcely need much explanation. The difficulty of driving on steep grades, even if flat, is sufficient, and ought not to be increased by side sloping the road, and thus increasing the gradient diagonally, any more than is absolutely necessary to force the surface flow towards the gutters. I have observed horses and wagons slide sidewise frequently on such hillsides, and noted the improved effect of flattened crowns on similar grades. *Andrew Rosewater.*

Omaha, April 22.

The table of street crowns, with formulae, referred to in Mr. Rosewater's letter, appear below:

TABLE OF STANDARD CROWNS FOR PAVED STREETS, CITY ENGINEER'S OFFICE OMAHA, 1898.

Distance between Curbs.	Crowns for Brick, Stone and Wooden Pavements in Feet. Grade of Street.										Distance between Curbs.	Crowns for Asphalt Pavements in feet. Grade of Street.						
	Level	1%	2%	3%	4%	5%	6%	7%	8%			Level	1%	2%	3%	4%	5%	
20 ft.	.25	.24	.23	.21	.20	.19	.18	.16	.15	Above 8% the same as for 8%.	20 ft.	.30	.27	.23	.20	.17	.13	Above 5% the same as for 5%.
25	.32	.31	.29	.27	.25	.24	.22	.21	.19		25	.38	.33	.29	.25	.21	.17	
30	.38	.36	.34	.32	.30	.29	.27	.25	.23		30	.45	.40	.35	.30	.25	.20	
35	.44	.42	.40	.38	.35	.33	.31	.29	.27		35	.53	.47	.41	.35	.29	.23	
40	.50	.48	.45	.43	.40	.38	.35	.33	.30		40	.60	.54	.47	.40	.34	.27	
45	.57	.54	.51	.48	.45	.43	.40	.37	.34		45	.68	.60	.53	.45	.38	.30	
50	.63	.60	.57	.54	.50	.47	.44	.41	.38		50	.75	.67	.59	.50	.42	.33	
55	.69	.66	.62	.59	.55	.52	.48	.45	.42		55	.83	.73	.64	.55	.46	.37	
60	.75	.72	.68	.64	.60	.57	.53	.49	.45		60	.90	.80	.70	.60	.50	.40	
65	.87	.78	.74	.70	.65	.61	.57	.53	.49		65	.98	.87	.76	.65	.54	.43	
70	.88	.84	.79	.75	.70	.66	.62	.57	.53		70	1.05	.94	.82	.70	.59	.47	
75	.94	.90	.85	.80	.75	.71	.66	.61	.57		75	1 13	1.00	.88	.75	.63	.50	
80	1.00	.95	.90	.85	.80	.75	.70	.65	.60		80	1.20	1.07	.93	.80	.67	.53	



FORM OF CROWN

NOTE—The formulæ used for the construction of the table are as follows:

For asphalt pavements $C=\frac{W}{500}(9-i)$.

For brick, stone and wood pavements $C=\frac{W}{1000}(20-i)$.

Where C=crown of pavement in feet.

Where W=distance between curbs in feet.

Where i=number of feet fall per 100 feet of street.

NOTE—Where the crown is less than 0.5 feet make the gutter 0.5 feet and where it is more than 0.6 feet make the gutter 0.6 feet, and for intermediate crowns make the gutter equal to the crown.

MORE ABOUT FILTRATION OF SEWAGE THROUGH COAL.

To the Editor of Municipal Engineering:

Having read with interest an article on "Filtration of Sewage through Coal" printed in your last issue, I would like to ascertain where I can obtain more detailed information regarding the plant at Lichfield. Information regarding the size of the beds, depth of material, rate of filtration and degree of purification obtained, would be of much interest to engineers engaged in this kind of work. Thanking you in advance for any infor-

mation you may be able to furnish I am Yours truly,

GEO. A. CARPENTER,
City Engineer.

Pawtucket, R. I., Jan. 24, 1898.

The information in the article referred to was obtained from a paper by Prof. A. Bostock Hill, M. D., professor of hygiene and public health and lecturer on toxicology in Mason college, Birmingham, England. Mr. Carpenter's question was referred to Prof. Hill, who has kindly sent us a complete copy of his paper, and he writes: "I may add that the experiments are still going on and on the extended scale are quite satisfactory. In the course of time, I hope to give a fuller account of these." We give below all of Prof. Hill's paper which did not appear in the article published in our January number, as follows:

LAYING THE BINDER COURSE OF AN ASPHALT PAVEMENT OVER OLD COBBLESTONE PAVEMENT ON CLEVELAND AVE., COLUMBUS, O.

"When the first elementary ideas as to purification of sewage had passed away two schools of thought arose; one advocated the treatment of sewage on land, the other, treatment without land, but by precipitation with various chemical reagents. Although precipitation when carried out scientifically, and under proper conditions can be relied upon to produce an effluent without smell, and of good appearance at first, we now know that there is no precipitant which will remove any material quantity of the dissolved organic matter in the sewage. The suspended matter can doubtless be completely taken away, but that which is in solution, and is in some respects more noxious than much of the suspended matter, can not be materially affected. Those who favored treatment on land no doubt could show that both by the processes of intermittent downward filtration, and by irrigation when carried out on suitable land and under scientific conditions, a good and fairly pure effluent could be produced. The Croydon sewage farm is a case in point. On the other hand the actions which have been taken against various authorities of late years for the pollution of streams and rivers, show that in a large number of

instances the purification effected is incomplete and partial. In many places land suitable for the treatment of sewage can not be obtained, and even when it is to be procured the expense entailed on the community by the purchase of a quantity sufficient for the needs of a large and growing town causes an outcry owing to the excessive cost.

"It is hardly to be wondered at, then, that ideas for purification by filtration through artificial media should have arisen, and we have now had experience of the results

WATER ANALYSES (WOLVERHAMPTON).

Parts per 100,000.	January 16th, 1897.		February 4th, 1897.	
	Tank.	Filter.	Tank.	Filter.
Free Ammonia	4·00	3·00	3·20	2·40
Alb. Ammonia	0·30	0·25	0·40	0·20
Chlorine	22·2	20·2	12·6	12·2
N. as Nitrate	0·4	2·2	0·55	0·93
O. absd. 4 hrs., 80° F.	0·94	0·126	1·44	0·195
Total Solids	142	134	118	102
Appearance	Sl. turbid.	F. bright and clear.	Sl. turbid.	F. bright and clear.
Odour	.....	.....	.....	.....

	February 24th, 1897.		March 20th, 1897.	
	Tank.	Filter.	Tank.	Filter.
Free Ammonia	5·10	2·53	5·05	4·03
Alb. Ammonia	0·34	0·07	0·48	0·11
Chlorine	.....	.....	21·2	19·2
N. as Nitrate	.....	.....	0·0	0·99
O. absd. 4 hrs., 80° F.	.....	.....	3·66	0·55
Total Solids	.....	.....	126	123
Appearance	.....	.....	Sl. turbid.	Bright.
Odour	.....	.....	Strong	None.

A. BOSTOCK HILL.

WOLVERHAMPTON SEWAGE.

Grains per Gallon.	June 23, 1896.		July 7, 1896.		February 3, 1897.		February 16, 1897.		March 8, 1897.		May 5, 1897.		May 11, 1897.	
	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.
Free and Saline Amm.	6·229	5·604	lost	4·004	1·867	1·868	3·308	2·338	3·486	2·325	4·012	2·335	4·968	2·912
Organic Amm.	0·456	0·072	0·337	0·098	0·169	0·030	0·218	0·55	0·233	0·056	0·334	0·063	0·366	0·052
O. absd. 4 hrs., 80° F.	3·162	0·238	4·967	0·236	0·974	0·155	1·602	0·223	1·245	0·197	3·361	0·334	5·067	0·281
Nitric Nitrogen	none	none	none	none	0·826	0·875	0·154	0·994	0·154	0·343	none	1·17	none	1·17
Combined Chlorine	25·27	23·17	20·58	18·76	8·54	8·33	10·15	10·36	9·73	9·59	13·58	15·40	15·47	15·68
Per cent. Purification on Organic Amm.	...	84·3	...	71·0	...	82·3	...	74·8	...	76·0	...	81·2	...	85·8
Per cent. Purification on Oxygen absd.	..	92·5	...	95·3	...	84·0	...	86·1	...	84·2	...	90·1	...	94·5

E. W. T. JONES.

which can be obtained by filtration through media patented and otherwise; and we also now know something of the means which are necessary for success. It was not, however, until the last few years that filtration through such media as ballast and coke had been shown to be effective in purifying the sewage of towns, and Mr. Dibdin, by his experiments, has brought prominently before us the valuable results that can be obtained from such filters.

"In the summer of last year Mr. Garfield, the manager of the Wolverhampton sewage works, became possessed of the idea to see what effect would be produced by the filtration of sewage through a filter composed of fine coal. The matter was mentioned to Mr. E. W. T. Jones, public analyst for that town, and these two gentlemen carried out experiments with filters, in which the medium was coal of different degrees of fineness. The result proved very satisfactory, and when it is remembered that the sewage of Wolverhampton is of such a nature owing to the large amount of chemical refuse contained in it that it is one very difficult to treat, it seemed that if satisfactory results could be obtained in this town better results might be

obtained on the average sewage of other communities.

"Experimental filters have been laid down therefore in several other places, and in the case of the City of Lichfield, which is under an injunction for pollution of a brook by the effluent from its sewage farm, I have had the advantage of observing the results obtained on the sewage by this means. Lichfield is a brewery town, and its sewage has an all-pervading odor of brewery but although much purification is effected the effluent is of such a character that on standing for only a few hours it invariably has an odor of brewery refuse.

"If such a sewage as this then could be treated by filtration through an inexpensive medium, and a result obtained which would prevent pollution, and would be far better than that already obtained by the land, here was a great desideratum, and as a result of

ANALYSES OF EFFLUENT (LICHFIELD).

Parts per 100,000	March 17th, 1897.		March 24th, 1897.		March 31st, 1897.		April 7th, 1897.	
	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.	Tank.	Filter.
Free Ammonia	0·412	0·400	1·00	0·30	0·75	0·42	0·875	0·40
Alb. Ammonia	0·062	0·030	0·15	0·058	0·12	0·028	0·130	0·056
Chlorine	5·1	12·0	6·0	7·4	6·1	6·5	5·7	6·5
N. as Nitrate	0·44	0·33	.....	1·07	.....	0·35	.....	0·33
O. absd. 4 hrs., 80° F.	0·424	0·131	1·24	0·14	0·676	0·268	0·952	0·202
Total Solids	68	78	70	71	70	70·5	60	64
Odour	Slight.	V. slight.	.....	.....	.....	.....	.....	.....
Appearance	Sl. turbid.	Bright and clear.	Sl. turbid.	F. bright and clear.	Sl. turbid.	Bright and clear.	Sl. turbid.	Bright and clear.

	April 14th, 1897.		April 30th, 1897.		May 8th, 1897.		September 9th, 1897.	
Free Ammonia	1·02	0·431	1·56	0·081	2·371	0·104	0·940	1·016
Alb. Ammonia	0·04	0·025	0·230	0·025	0·342	0·048	0·192	0·072
Chlorine	5·4	5·9	6·9	7·4	7·7	7·7	5·4	32·9
N. as Nitrate	.....	0·44	.....	0·88	.....	1·23		
O. absd. 4 hrs., 80° F.	0·2	0·16	1·08	0·12	1·82	0·2	0·95	0·285
Total Solids	66	68	64	70	69	77	51	118
Odour	.....	.....	S.S. brewery refuse.	None.	S.S. brewery refuse.	None.	S.S. brewery refuse.	None.
Appearance	Sl. turbid.	F. bright and clear.	Sl. turbid.	Bright and clear.	Sl. turbid.	Bright and clear.	Sl. turbid.	V. Sl. opal.
							New Filter.	

A. BOSTOCK HILL.

refuse. It is well known that of all sewages, one containing a large proportion of brewery refuse is the worst to treat, in fact in nearly all towns where brewing is a staple industry, from Burton downwards, injunctions have been obtained owing to pollution being caused, or nuisance produced, from the farm. I may add here that in the case of Lichfield the sewage is precipitated in tanks of modern construction and well adapted for the work to be done. It is then passed through land well drained in the usual way, experiments carried on on a small filter, it would appear that such purification can be attained.

"It would appear that the action of coal is different from that of other media hitherto used, in that analysis shows that there is a far greater difference in the amount of oxygen absorbed, before and after filtration, than of organic matter, as shown by the amounts of organic ammonia obtained. The following are the details of the construction of the filter, which have been kindly furnished to me by Mr.

Garfield. As far as is known any kind of coal will do, but it should be as clean as possible, and, if necessary, washed. The depth should not be less than five feet when it can be obtained. The first layer of the filter consists of six inches of coal, about half-inch cubes in size, over and above the effluent drain pipes. This layer is blinded with a little quarter-inch cube coal. Above this comes a layer of thirty-inches of one-eighth-inch cube, and on the top of that a thirty-inch layer of one-sixteenth-inch cubes. The top course is a six-inch layer of coal dust which has passed through a three-sixteenth-inch mesh, the fine dust not being removed as in the other layers. The water to be purified is applied to the filter by means of gutters placed level on the surface of the filter. The rate of filtration has been up to now one million gallons per acre per day, but it is believed that this quantity may be increased. The whole of the coal used, except the bottom six inches of half-inch cube, will pass a three-sixteenth-inch mesh, and is thus so fine that it is almost a waste product at the colliery."

The remainder of the paper relates to the results of the experiments, and will be found in the January number of MUNICIPAL ENGINEERING, except the analyses, which are given herewith.

IRON PIPE FOR SEWERS.

By Charles Carroll Brown, M. Am. Soc. C. E.

A proposition to construct about a mile of sewer under ordinary conditions, except that it was particularly necessary that the sewer be water tight, was voted upon at the spring election in an Illinois city, a part of the resolution requiring that iron pipe be used. In parentheses it may be asked what special qualifications has the ordinary voter for determining the quality of material that should be used in a sewer, or the size and route it should have, and it may be suggested that while the power to veto the expenditure of money for the sewer, entirely, may properly belong to the people, it is not desirable that the design and construction of the sewer be taken out of the hands of the experts, presumably, in the employ of the city government. The iron pipe was planned because it was strong, could be made reasonably water tight in the beginning, and was estimated to cost little if any more than a double-ring brick sewer of the same size.

Some of the objections to iron pipe follow. Its cost is greater than that of a sewer of brick or vitrified pipe, unless the thickness and quality of material be so reduced that its strength and life are jeopardized. Theoretically, the use of iron is wrong from the fact that iron is not a stable material, but is acted upon by the oxygen in the air and the water, especially when wet, and is also acted upon by other gases and by chemicals in the water. Its tendency is therefore toward disintegration and its final

destruction is only a matter of time. This is true even when there is a serious attempt to protect the iron by some impervious coating. Especially in a sewer with its floating and sliding debris, such a coating is soon broken and oxidation of the iron proceeds even more rapidly in the small spots and cracks where the protecting coat is cracked or worn off. The question of a permanently impervious sewer is, therefore, not answered by an iron pipe. Well burned and glazed sewer pipe, well burned brick of good material and good cement mortar are not acted upon by the air or the sewage. If well put together they are indestructible, except by the wear of debris on the bottom, accidental blows from heavy materials passing through the sewer, or badly made connections. Special care and special constructions for the support of the sewer where the foundation is bad will secure a water-tight sewer. Similar constructions, though probably not so elaborate, would be necessary with iron pipe, so that with good pipe of thickness great enough to last a reasonable length of time, good materials of all kinds and good workmanship, neither brick nor iron would have much advantage over the other in cost. If the sewer is small enough to use vitrified sewer pipe, that material is the cheapest for nearly all sizes. There is seldom any question of lack of strength in pipe except where the sewer is in loose material at a great depth or with a heavy weight on it directly over the sewer, as under a railroad. It is sometimes necessary to have iron pipe at a creek crossing to prevent washing out and to take the pressure of debris or water if the pipe must be above the bottom of the creek.

ASPHALT PAVEMENT ON GRAND AVENUE, MILWAUKEE, WIS.

The action of the air and water on the iron would be greater than in a water pipe because the water pipe is practically always full, and does not have the alternations of wet and dry, the frequent variations in

chemical composition, the free access of air and the scouring action of sliding debris, such as gravel, sand, stones, bricks, etc., which are found in a sewer. Even in water pipes the formation of tubercles is sometimes very rapid. It is often necessary to scrape off these tubercles because in time they become so large as seriously to reduce the capacity of the pipe. The amount of this reduction varies from year to year, but its effects are so well observed that tables have been made showing the amount of loss of capacity of each size of pipe for each year of its life. Such tubercles would have a similar effect on the sewer. They might be scoured off the bottom, however, as rapidly as they were formed.

One peculiar item of the proposition was to make the pipe in two parts, a lower half cylinder and an upper half cylinder, with flanges by which the two halves could be bolted together. Aside from the mythical advantage of being able to take off the upper half of a pipe if it was necessary to get into the sewer to remove a stoppage or repair it, was given the ability to increase the size of the sewer by removing the top, building up side walls of brick and putting the top over these walls. The lack of knowledge of the action of engineering materials, the abandonment of the idea of an impervious sewer, and the disregard for expense in the extra material in the flanges and packing, and the cost of laying, in this last proposition, are evident to any engineer. As usual in our smaller cities nearly every citizen is a natural engineer without the necessity of study or practice, and so it is not necessary to secure the advice of an expert. Such propositions as the one described are only too numerous, and waste only too much good money. A few hundred dollars at the beginning for a well considered plan by a man of ability, training and experience will save thousands in construction, but the nearness of the small sum obscures the larger. Then, too, it is carrying coals to Newcastle to bring in an engineer among so many natural experts who present their engineering advice, ostensibly without cost, in the intervals of their regular occupations.

COMPARISON OF AMERICAN AND FOREIGN PORTLAND CEMENTS.

By W. W. Maclay, C. E.

In seven years we have seen a notable increase in the amount made, and improvement in the quality of American Portland cement. We have also seen the price falling, both for foreign and domestic Portland, with the quality of the domestic Portland steadily advancing by fine grinding, until now the American high grade Portland cements easily come up to the German standard, even when tested according to the American practice of making plastic mortar, although this practice gives much lower results than testing made under the German normal rules.

In the American system more water is used in mixing the mortar

than in the German official test, the American rule being that the mortar "should be stiff and plastic," whereas in the German test it is made like damp earth, with very little plasticity.

The American mode of testing by making the mortar plastic has the following advantages: First, mortar of a plastic consistency is more like the condition in which it is used in actual practice, and the strength deduced therefrom is it made by hand, and this is now considered the best practice both in England and Germany, and will doubtless soon prevail in this country. From these remarks it must not be understood that the testing of cement is other than laboratory work, for all attempts to popularize cement testing so that it can be brought within reach of all who use it have signally failed. Cement tests, to be of any comparative value, will always have to be made

ASPHALT PAVEMENT ON MOSS AVENUE, PEORIA, ILL.

more valuable as a guide to the engineer than the higher results obtained from the German method. In the second place, the plastic mortar does not admit of various degrees of consolidation in the molds by ramming to the same extent as the stiffer mortar does, and this circumstance eliminates a good deal of the unequal personal equation or treatment that is so much to be desired in testing cement. For the same reason, it is much preferable to have the mortar or cement paste for testing purposes mixed in a machine than to have by persons accustomed to accurate methods, and possessing a considerable degree of experience and skillfulness in this particular line of physical research, which is only to be acquired by long practice. No great equipment of scientific education is necessary for the cement tester; but on the other hand, he must have a large amount of accuracy and practical experience, with the conscientiousness that will prevent him from slighting or slurring over details in order to obtain results.

In this connection it may be

stated that when a standard system of cement testing was agreed upon by the engineers and manufacturers of Germany and Austria, official stations for testing cement under the standard system were established at Berlin, Munich and other chief cities on the continent. These stations are in charge of highly educated officials, generally chemists, and are equipped with all the most improved testing and scientific apparatus. Through the experiments and researches made at these stations, the most valuable contributions to cement literature have been made. Desirable as would be the establishment of similar official government cement testing laboratories in the United States, it does not at present seem possible, for the same reasons that have been given as preventing any connection between the government and the adoption of a standard system of testing cement. In Germany strong efforts have been made to have regulations at these testing stations which should fix higher prices for cement which exceeded the requirements of the standard test, so that Portland cement should be officially valued according to its quality. These efforts have not yet been successful, and the best manufacturers of Portland cement are still obliged to see their cements sold for about the same price as inferior cements—a condition of affairs that would certainly seem to warrant some change.

Notwithstanding the great amount that has been written on the subject of Portland cement testing, and notwithstanding the vagaries and unexplained behavior of the cement itself, the fact still remains that it is perfectly possible to formulate a system of testing and chemical investigation that will in almost every case not only separate good from bad cement, but will also show the excellence of the higher grade made by the best factories in this country and abroad. As an evidence that this can be done, we have the exceedingly satisfactory working of the German rules for testing, since 1878, although after these rules had been in operation nine years it was found necessary to revise them, and some similar revision is now necessary in the system of tests recommended by the committee of the American Society of Civil Engineers, 1885. This system of testing has been found much fault with by certain engineers, because greatly varying results have been obtained with it in testing the same cement, by different persons, all claiming to be following the system recommended by the committee; but such faults, if they exist, can be easily remedied, in any system, by giving more details.

To the writer's mind, the great evils the Portland cement consumers and manufacturers in this country have to contend with, are two: *First*. The absence of any recognized system of testing, such as now prevails in Europe. *Second*, The very general feeling existing among our engineers, architects and builders, that each one can decide better for himself the way to test the cement, and the standard that it should reach, than by adopting any system of testing, and standards formulated by a body of men selected for this purpose, on account of their knowledge and judgment in cement matters. The individual tester, by his own system, loses a great deal by being unable to intelligently compare his work with the experience of others, and he greatly hampers the manufacturer by his vagaries. One of these vagaries very commonly adopted throughout the country,

RIVER CROSSING AT MINNEAPOLIS SHOWING PILING AND LAYING OF RESERVOIR PIPE LINE.

but in use nowhere else, is the one day test for Portland cement; this, as practical users and testers know, is absolutely unreliable to indicate the value of Portland cement, and being very misleading should be left out of all well-drawn cement specifications.

Another misleading test for Portland cement is the neat test, as it is perfectly possible for coarsely ground Portlands of low sand-carrying capacity to show much greater tensile strength, gauged neat, than finely ground Portlands that can be mixed with much more sand without lowering the strength of the mortar. The most unsatisfactory feature of the neat test is its liability to decrease in tensile strength after some maximum period, usually found in dense, hard burned Portlands of the highest grade to be between three months and one year. No such decrease is shown in the sand tests, which, with sound Portlands, go on increasing for several years, until the maximum is reached.

In relation to supplanting the neat test by that of the cement mixed with three parts of standard sand, it is quite curious to note the reluctance with which the most prominent cement engineers give up the neat test, while acknowledging the many advantages over it possessed by the sand test.

Mr. John Grant said: "Nothing has done so much to raise the quality of cement in Germany as the adoption of the system of testing its strength when mixed with three times its weight of sand of a standard gauge and quality, and made into briquettes, which are tested when twenty-eight days old. To give a clue to any cause of discrepancy or disappointment which may arise, and for experimental purposes it is desirable to ascertain its weight, degree of fineness, time of setting, and, where there are facilities for it, the chemical character and other features of cement. But if it give the required strength when mixed with sand after four weeks, it may be accepted without fear, and the specification is much simplified." Mr. Grant also adds, referring to himself: "The author has for several years past used the test of cement with sand, and would have adopted it long before he did but for the occasional and temporary difficulty it involves at the commencement of works carried on in public thoroughfares—of waiting a month to know the results. This can, however, in most cases be got over, either by making early arrangements for getting the cement by a tentative test at seven or fourteen days, or by other methods, approximately ascertaining the quality of that which has to be first used; but no cement should be rejected before the test at twenty-eight days has been made."

"Numerous experiments by a great number of observers in different countries have shown beyond dispute that heavy, well-burnt cements, which, when tested neat, have given high results, have, notwithstanding, when mixed with sand, turned out disproportionately weak. Even when the important test of fineness is coupled with that of weight, the strength of cement when tested neat does not always correspond with its strength when mixed with sand. The only thing wanting to make this (sand with cement) test perfect is time—*i. e.*, to be able to wait for the results months instead of weeks." And again: "It was agreed that the test with sand was the most important. This was proved beyond doubt by several of the tables in the Appendix ('Portland Cement:

APPROACH TO THE RIVER CROSSING ON THE EAST SIDE AT MINNEAPOLIS FOR THE LAYING OF RESERVOIR PIPE LINES.

its Nature, Tests, and Uses,' Paper No. 1700, by John Grant. Excerpt Minutes of the proceedings of the Institution of Civil Engineers, Session 1879–1880), which showed that the test of neat cement alone would lead to great errors, reduced, no doubt, but not eliminated, by coupling it with the test for fineness. Still, the neat test had its uses, and he had always retained it, though he no longer depended upon it." In view of Mr. Grant's own statement as quoted above, it is difficult to see why he still retains the neat test, although "he no longer depends upon it."

Dr. Michaëlis, the German authority on cement, is not much more convincing than Mr. Grant in the reasons that he gives for still using the neat test, in the same discussion from which Mr. Grant has been quoted. Dr. Michaëlis says: "If the question was raised as to testing cement neat or mixed with sand, and if it were acknowledged that only one of these two methods was permissible, then there was no doubt that the decision must be in favor of the sand mixture. It was only when mixed with sand that one of the most important properties of cement could be appreciated, namely, its power of uniting other substances. This was totally distinct from its strength, and depended chiefly upon fine grinding, which was of primary importance. Fine grinding was the only rational method of utilizing the cement to its fullest capacity." And again: "The next question was whether it was right to go from one extreme to the other by giving up the test with neat cement, which had been so long customary in England, and by substituting for it the test with sand. From the commencement Dr. Michaëlis had been of the opinion that the proper course lay between the two. It was the test with neat cement alone that indicated what proportion of water was the most favorable for the particular cement under examination." And again: "It was a mistake to think that the tests made with sand according to the German standard rules give more regular and uniform results than briquettes made in the same way with neat cement. A method of carrying out the latter test could quite as easily be prescribed as for the sand mixtures. He would recommend the retention of the test with neat cement."

The above quotations from those who are justly considered as among the highest authorities on cement subjects, show how much opposition there is to abandoning the neat test in favor of the sand test, and yet the change has been made in Germany, and will probably some day be universally adopted.

In a series of excellent articles that appeared in MUNICIPAL ENGINEERING last year, the views of a great number of American engineers are given as to the best methods for testing Portland cement; and while, as would naturally be supposed, these show great differences in opinion, as to which is the best method for testing, these differences only emphasize the necessity of having some standard for testing adopted by the leading engineers and manufacturers of this country. One step towards the obtaining of this standard would be the result of a uniform system of tests being adopted by the United States government and Municipal Engineering Testing Laboratories throughout the country; but it seems hopeless to expect this, as nowhere is there a greater difference than in the specification of tests at present used by the government engineers.

LAYING RESERVOIR PIPE LINES ACROSS RIVER AT MINNEAPOLIS.

PORTLAND CEMENT REQUIREMENTS SPECIFIED BY THE U. S. GOVERNMENT.

The table below was compiled by Maj. C. A. P. Hatfield, by direction of the Board of Engineer officers in charge of fortifications.

TABLE SHOWING PRINCIPAL FEATURES OF SPECIFICATIONS FOR PORTLAND CEMENT, AS REQUIRED BY OFFICERS OF U. S. ENGINEER CORPS, 1896-'97, WITH A FEW OTHERS INTRODUCED FOR COMPARISON.

File No.	Fineness. Meshes. Per cent.	Lin. in.	Sq. in.	Test comp.	Time of set. Initial.	Time of set. Stiff.	Time of set. Hard.	Tensile strength. Neat. Air. days 1	7	Air and water, hours A. W.	Air 24 hours, and water: days 1	6	7	27	28	29	1 cement : 3 sand. Air 24 hours, and water: days 6	7	27	28	29	Location of work and officer in charge
1*	95	50	2,500	..	..	..	..	..	..	..	..	120	..	325	..	..	450	..	..	..	..	..	Major Quinn, Fort St. Philip, Jan. 27, 1896.
	80	100	10,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
3*	98	..	2,500	..	..	..	30′	..	..	..	..	..	..	400	..	500	..	..	125	..	200	..	Major Hoxie, Herr's Island Dam, Feb. 11, 1896.
	87	..	10,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
7*	95	..	4,000	60*	..	..	..	150	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Lieut.-Colonel Mansfield, Fort Warren, March 16, 1897.
8	96	50	..	..	..	..	..	70	..	..	..	..	..	380	..	400	..	..	..	..	..	..	Major Mahan, Santa Rosa, March 26, 1896.
12	To be tested.	..	..	..	..	60′ to set.	..	250	450	..	..	..	..	400	..	600	125	..	200	..	..	..	Major Raymond, Finn's Point, July 23, 1896.
13	95	..	2,500	..	..	Slow.	..	150	..	..	..	..	..	380	Such others as the Engineer di ects.								Lieut.-Colonel Damrell, Portland, Me., July 24, 1896.
14*	95	100	10,000	60*	..	..	30′ +	..	..	..	12	12	..	500	..	650	..	..	..	..	..	..	Major Russell, Fort Morgan, Ala., Aug. 10, 1896.
16	95	50	..	..	..	..	..	75	..	..	..	200	..	300	..	400	..	..	..	..	..	..	Colonel Hains, North Point, Md., Sept. 25, 1896.
17*	100	50	..	..	..	..	60′ +	..	..	..	..	..	..	..	..	..	125	..	200	..	..	..	Captain Carter, Tybee, Ga., Oct. 16, 1896.
	90	100	..	..	..	..	..	..	..	..	200	..	..	..	..	..	..	..	..	..	..	..	
18	..	..	..	..	..	60′ + to set.	..	250	450	..	..	..	..	500	..	600	125	..	..	..	..	200	Colonel Gillespie, Fort Hancock, Oct. 20, 1896.
19	90	50	..	..	..	3 h. +	..	..	..	..	..	..	..	500	..	600	1 cement : 2 sand.						Lieut.-Colonel Heap, Cape Fear River, Oct. 20, 1896.
	90	100	..	..	..	8 h. —	..	..	..	..	..	..	..	..	..	..	175	..	250	..	..	..	
	70	200	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
20	95	..	2,500	..	45′ +	Dark color preferred, — 3% carbonate of lime.	..	..	..	a125	..	..	375	..	..	..	..	..	..	..	..	..	Major Allen, Sheridan Point, Va., Oct. 23, 1896.
	95	50	..	..	..	1 h. +	..	..	..	a125	..	..	..	..	..	..	1 cement : 2 sand.						
21*	90	100	..	..	..	8 h. —	..	..	..	..	..	..	400	..	500	..	150	..	200	..	..	..	Lieut.-Colonel Benyaurd, Key West, Oct. 24, 1896.
	70	200	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
22	95	50	..	..	..	..	..	b75	..	..	..	..	300	..	400	..	..	..	..	..	..	..	Colonel Hains, Hawkin's Point, Md., Oct. 28, 1896.
23	95	50	..	..	..	+ 60′ to set.	..	250	450	..	..	..	400	..	..	600	125	..	..	..	..	200	Major Lockwood, Dutch Island, R. I., Oct. 28, 1896.
	77	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
24	95	50	..	..	..	..	..	b75	..	..	..	..	400	..	..	..	..	..	..	..	..	..	Major Leach, Great Gull Island, N. Y., Oct. 28, 1896.
25	85	100	..	..	..	+ 60′ final set.	..	200	..	..	..	375	..	500	..	..	125	..	175	..	..	..	Captain Abbot, Sullivan's Island, S. C., Oct. 9, 1896.
26	95	50	..	..	..	+ 30′ to set.	..	200	..	..	..	450	..	..	700	..	..	..	..	..	..	..	Major Davis, San Diego, Cal., Nov. 9, 1896.
27	95	50	..	..	..	+ 30′ to set.	..	200	..	..	..	450	..	..	700	..	..	..	..	..	..	..	
28	95	50	..	..	..	..	..	b75	..	..	..	300	..	..	400	..	..	..	..	..	..	..	Major Miller, Galveston, Tex., Nov. 12, 1896.
29	95	50	..	..	..	Slow.	..	175	..	..	..	400	..	..	..	..	..	..	..	..	..	..	Lieut.-Col. Damrell, Ft. Constitution, N.H., Nov. 17, 18'6.
												Such other tests as may be necessary.											
30	95	..	2,500	..	..	..	..	150	..	..	..	380	..	..	..	..	..	..	..	..	..	..	Lieut.-Colonel Damrell, Portland, Me., Nov. 19, 189'.
												Such other tests as may be necessary.											
	90	50	..	..	..	1 h. +	..	..	..	a125	..	400	..	500	..	..	1 cement : 2 sand.						
31	90	100	..	..	..	8 h. —	..	..	..	..	..	..	..	..	..	..	150	..	200	..	..	..	Lieutenant-Colonel Benyaurd, Key West, Dec. 2, 1896.
	70	200	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
32	95	..	2,500	..	..	Slow.	..	175	..	..	..	400	..	..	..	..	..	..	..	..	..	..	Lieutenant-Colonel Damrell, Portland, Me., Jan. 21, 1897.
												Such other tests as may be necessary.											
33	..	..	..	..	..	..	..	250	450	..	..	..	..	400	..	600	125	..	200	..	..	..	Major Raymond, Finn's Point, Jan. 22, 1897.
								Tests will be made of fineness, strength, soundness and time of setting.															
35*	95	100	10,000	..	..	30′ +	..	..	..	..	12	12	..	500	..	650	..	..	..	..	..	..	Major Russell, Fort Morgan, Ala., Jan. 28, 1897.
											200												
36	95	..	2,500	..	..	Slow: set in + 5′.	..	b125	..	..	..	Slow 400					..	..	..	..	..	..	Major Allen, Aqueduct Bridge, D. C., Feb. 20, 1897.
	..	..	..	..	..	Quick: set in — 15′.	..	b100	..	..	..	Quick 300					..	..	..	..	..	..	
								Not more than 3% carbonate of lime.															
37	"Atlas," "Alpha," or other brand of equal quality (See No. 36).																						Major Adams, Fort Wadsworth, N. Y., Feb. 26, 1897.
38	95	..	2,500	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Major Allen, Aqueduct Bridge, D. C., April 10, 1897.
39*	90	50	2,500	60*	..	..	..	..	..	..	..	300	..	600	..	..	160	..	240	..	..	..	Captain Chittenden, Osage City, Mo., May 14, 1897.
	88	100	10,000	..	..	..	30′ + 6.′ +	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
40	95	..	2,500	65*	..	..	30′ + 60′ +	..	..	c150	..	400	..	..	550	..	125	..	..	..	..	200	Captain Taylor, Morrowstone Point, Wash., May 26, 1897.
	85	..	10,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
43	95	50	..	..	..	..	..	b75	..	..	..	300	..	..	400	..	..	..	..	..	..	..	Colonel Hains, North Point, Md., June 22, 1897.
46*	95	..	2,500	65*	..	..	30′ + 6′.′ +	..	..	c150	..	400	..	..	550	..	..	..	..	..	..	..	Captain Taylor, Admiralty Head, Wash., June 23, 1897.
	85	..	10,000	70*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
47	95	50	..	..	..	..	..	250	450	..	..	..	..	..	..	..	..	..	..	..	..	..	Captain Leach, Plum Island, N. Y., June 28, 1897.
49	95	50	..	..	..	+ 30′ to set.	..	..	..	..	..	..	..	..	..	..	125	..	200	..	..	..	Major Davis, San Diego, Cal., July 7, 1897.
50	95	..	4,000	60*	..	..	..	b150	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Lieut-Colonel Mansfield, L. I. Head, Mass., July 8, 1897.
51	85	100	..	..	..	+ 60′ to set.	..	200	..	..	..	375	..	500	..	..	125	..	175	..	..	..	Captain Abbot, Sullivan's Island, Aug. 10, 1897.
52	96	50	..	..	..	Mixed with 33% water.	..	75	..	..	..	380	..	..	490	..	..	..	..	..	..	..	Major Mahan, Fort Pickens, Aug. 19, 1897.
53*	90	50	..	..	..	..	60′ + 4h.	..	..	..	..	450	..	540	..	..	150	..	240	..	..	..	Major Marshall, Illinois & Mississippi Canal, Aug. 23, '97.
	87	100	..	..	..	..	12h.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
55	..	..	..	..	..	..	..	250	450	..	..	..	..	..	..	..	125	..	..	..	..	200	Lieut.-Col. Ludlow, Harlem River, N. Y., Sept. 13, 1897.
56*	96	50	..	..	..	45′ +	..	..	..	c125	..	600	..	500	..	..	125	..	175	..	..	..	Major Powell, Monongahela River, locks, Sept. 20, 1897.
58	95	..	4,000	..	..	+ 30′ to set.	..	b300	..	..	..	450	..	..	700	..	..	..	..	..	..	..	Captain Casey, Fort Monroe, Nov. 23, 1897.
59*	95	..	2,500	65*	..	..	30′ + 60′ +	..	..	c150	..	400	..	..	550	..	125	..	..	..	..	200	Captain Taylor, Admiralty Head, Wash., Dec. 22, 1897.
	85	..	10,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
60	95	..	2,500	..	..	..	..	..	..	..	..	400	..	..	..	..	125	..	..	..	..	..	Enlargement of the Erie Canal, New York, 1896.
	90	..	10,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
61*	90	..	10,000	..	..	..	..	..	..	..	..	350	..	..	..	..	c150	..	..	..	..	..	New East River Bridge, New York, September, 1897.
62*	90	50	2,500	60*	30′ +	Specific gravity + 3.	..	..	..	..	4175	450	..	550	..	..	190	..	220	..	..	..	Department of Public Works, Philadelphia, Pa., Engineering News, Vol. XXXV., page 307, 1896.
	90	100	10,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	70	200	40,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
	98	74	..	60*	..	..	30′ +	..	..	..	..	400	..	..	..	..	140	..	200	..	..	..	Topeka, Kan., Bridge, Eng. News, 1896, Vol. XXXV., p. 221: "It is not probable that any American natural Portlands (so called) will meet these requirements."
63	95	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	

*Treat by thin pats in warm, or hot water, included. (a) In air until set, in water balance of 24 hours. (b) Kept in air and broken 24 hours after setting. Where two sets of figures are shown, the upper one is for slow, and the lower for quick action. (c) Kept one day or until set; balance of time in water. (d) 24 hrs. in water of or hard set. ject cement to 2 sand.

PURIFICATION OF SEWAGE IN ENGLAND.*

By John W. Alvord, C. E.

In the growing interest and attention which the subject of sewage disposal is now receiving in this country, a large share of attention is being given to land methods. It may be said that intermittent filtration is the sanitary fad of the hour. Perhaps it deserves the attention it receives, but it must not be overlooked that for localities where land is not available for reasonable cost, where the quantity of sewage to be purified is large, and where dilution is partially available for clarified effluents, the chemical methods of sewage purification may become a sturdy rival for favor, and will probably outstrip in

*Read Before the Illinois Society of Engineers and Surveyors.

BREAKING GROUND FOR THE RESERVOIR PIPE LINES IN MINNEAPOLIS.

economy and efficiency from a practical point of view its more popular rival.

If then the sanitary expert comes to a problem where conditions exist favorable to chemical disposal, it behooves him to confront the problem without prejudice and with a clear comprehension of the possibilities and advantages of that method of purification.

During a visit to England and the continent in 1888, at which time many plants for the purification of sewage were examined, the writer was very favorably impressed with a chemical system, in use in the borough of Acton, a suburb immediately west of London, which he visited at that time, and of which he made careful notes of operation and efficiency. Although considerable time has elapsed since that visit, no important installation of the system has been made in this country, while in England it has rapidly grown in favor, being installed in Headon, Huddersfield, Castle Douglass, Guildford, Swindon, Normanton, Royton, Astley Bridge, Crompton, Chorley Gorton, Alcester, Lincoln, and quite a number of other places.

The borough of Acton is a residence suburb immediately west of London, containing at the present time probably over 50,000 population. At the time of the writer's visit, in 1888, a population of from 8,000 to 10,000 were connected with the new sewerage system, and the sewage purified in the new works then only recently completed. The natural drainage of the borough, entering the Thames river above London, it had become necessary, as with other municipalities in that locality, to purify the sewage before discharging it into the river, in order that it might not injuriously affect the water supply of the metropolis.

The works consisted of an arrangement of buildings and tanks, such as is usually necessary in chemical precipitate works, and was so designed as to be ultimately extended for a population of 75,000 people. They were tastefully laid out, and of neat appearance, being surrounded with flower beds and lawn. They consisted of buildings for pumping station, chemical house, sludge house, store house, etc., together with the precipitating tanks and filtering beds. The entire plant occupied about one and one-half acres.

The sewage entered the works from two main sewers. One, a high level, required no pumping, but flowed directly into the precipitation tanks, and from thence to the filtering bed, while the low level sewer emptied into a receiving well thirty-six feet deep, from which it was raised by suitable machinery to a junction with the high level sewer.

The precipitating tanks were three in number, rectangular in shape, and constructed of masonry holding 140,000 gallons of sewage each. These tanks have, I am informed, since been superseded by the circular form, in which a revolving arm at the bottom sweeps around the tank at stated intervals, and draws out the suspended matters at the bottom, through perforations in the pipe arm. This form of tanks is known as the Candy tank.

Before the sewage entered the precipitate tank ferozone was added to the sewage at the rate of eight grains per gallon. "Ferozone" and "polerite" are trade names for a manufactured chemical and filter material.

DRAINAGE PIPE LAID IN THE DITCH OF THE MAIN BOULEVARD, MINNEAPOLIS.

"Ferozone" is a preparation rich in salts of alumina and salts of iron, both in the ferrous and ferric condition. By virtue of its soluble salts it soon causes subsidence of the suspended solids, and attacks molecular constitution of that portion of the organic matters in solution which can not be removed by ordinary precipitation in the settling tank. It so alters the constitution of these putrescible matters that further oxidation thereof by filtration becomes more certain and more easily accomplished.

An analysis of its constituents at Acton in 1888, by Sir Henry Roscoe gave the following results:

Moisture	20	per cent.
Sulphate of iron anhydrous	21.17	" "
Sulphate of aluminum	22.20	" "
Carbon	7.16	" "
Constituents insoluble in water	12.70	" "
Water of constitution and other matters.	16.77	" "

Ferozone can be varied in its composition to suit sewage of various analysis and concentration.

The results of this precipitant are to create a sludge of high manurial value, being richer in ammonia than that produced by lime or other process, and was therefore sought after as a fertilizer. At the time of the writer's visit to England no other chemical works were able to obtain much of any price for their sludge, and in most cases were obliged to haul it away at considerable expense to themselves, while the sludge from the works at Acton were being sold at a considerable though somewhat variable price, dependent upon the demand.

The sewage was allowed to settle in the precipitating tank for three or four hours, the sludge being drawn off to the sludge house where it was first pumped into a rotary agitator, at which time more ferozone was added. It was then filter pressed, dried and ground for manurial purposes. The sludge produced is about twice as thick and therefore only half the bulk of usual or normal sludge.

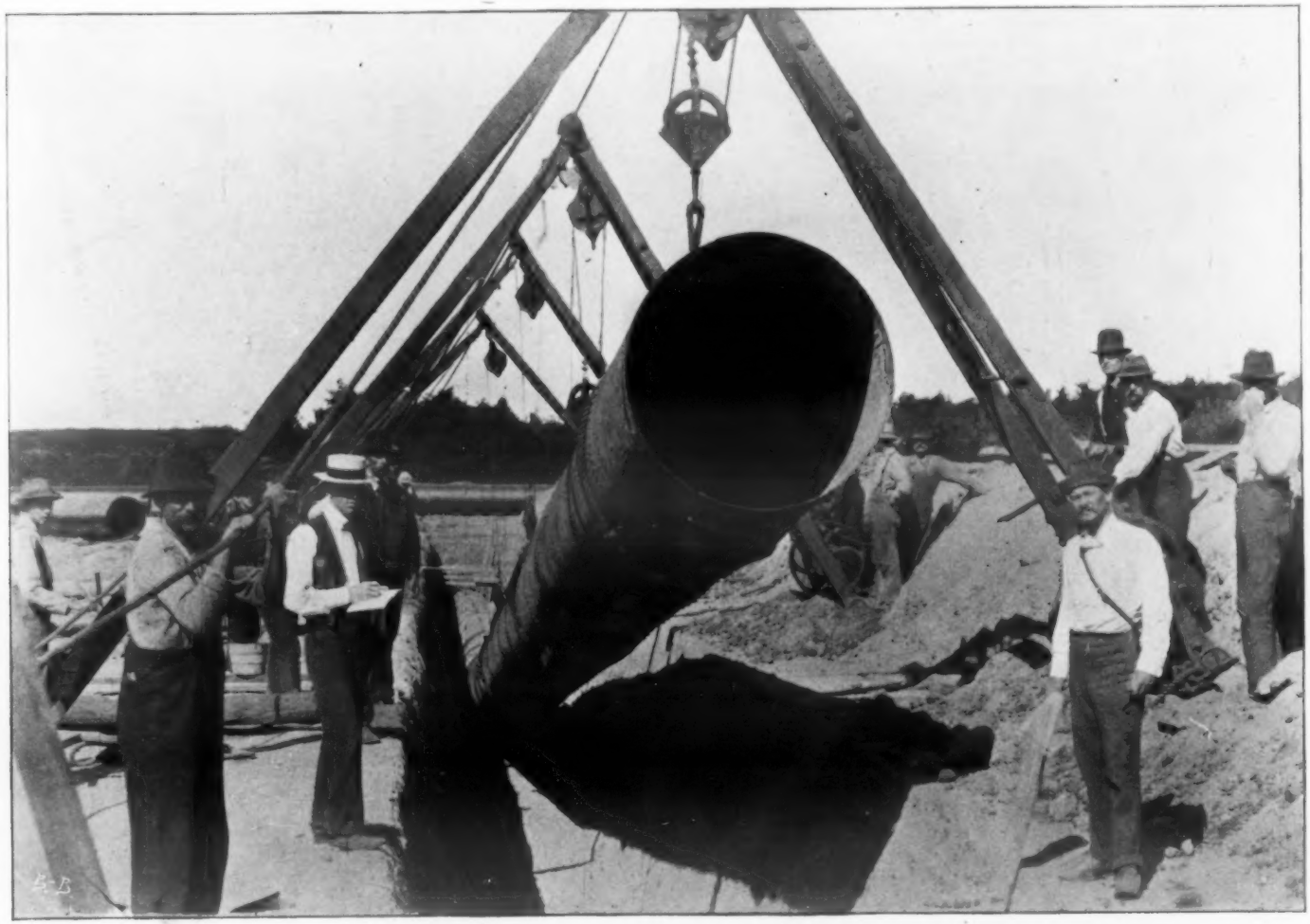
The pressed cakes were easily dried under cover, and the powder, when ground, was inoffensive, so that it could be kept without nuisance in dry store until the season came for selling it as a fertilizer. An analysis showed that it contained nitrogen equal to from one to two per cent. of ammonia, besides phosphates.

The sewage, after its suspended matters were removed in the precipitating tank, was passed into flowing outlet pipe on to the filter beds. Sewage was passing through the filters at the time of the writer's visit at the rate of about 1,000 gallons per square yard per twenty-four hours, four hours out of the twenty-four being allowed each bed for rest and the renewal of its oxygen.

The filter beds were constructed of an upper and lower layer of sand and an intermediate layer of about two feet in thickness of "polerite," the whole depth of bed being about five feet, and the construction being that usual to intermittent downward filtration, with, of course, a greatly lessened area due to the improved clarification of the sewage and the greater efficiency of the "polerite."

"Polerite," as has been said before, is a trade name for a manufactured filter material. It is a black, hard and highly porous substance, rich in magnetic oxide of iron and silica, insoluble in water, practically indestructible, and like the sand in intermittent filtration, does not require to be renewed.

It is a deodorizer and purifier by virtue of the oxygen occluded in its microscopic pores, and constantly



LAYING A SECTION OF 112 FEET OF 50-INCH FORCE MAIN AT MINNEAPOLIS.

supplied by the surrounding air and water.

Its analysis made by Sir Henry Roscoe about three months before the writer's visit was as follows:

Magnetic Oxide of Iron	53.85	per	cent.
Silica	25.50	"	"
Lime	2.01	"	"
Alumina	5.68	"	"
Magnesia	7.55	"	"
Carbonaceous matter and moisture	5.41	"	"

It would seem that this material seemed to have a greatly increased oxiderous power over ordinary sand. What its bacteriological action may be he is in no position to judge, but that it would seem to be efficient may be judged from the fact that after some months the purification seemed to be even more complete than at first. It is, however, fair to assume that the process is similar to sand filters in most respects, in that the bacteriological growth occurs in the upper or sand layers, multiplying the nutrifying organism which brings about the higher form of fermentation, and therefore prevents the starting of putrefaction. Descending, the waters, still containing much organic matter in solution, are spread out and divided into fine spray, passing through the microscopic pores of the polerite, where immediate oxidation occurs.

The effluent from the underdrains was clear, bright and sparkling. An analysis was as follows:

Chlorine, 6,400 parts per 100,000.
Free ammonia, 0.025.
Oxygen absorbed from permanganate of potash in four hours, 0.325.

The above analysis, while not indicating a perfect drinking water, was certainly remarkably pure when the rate of filtration is taken into consideration, and where an inconsiderable amount of dilution is available, is ample for all practical purposes.

No nuisance was observed in the vicinity of the plant or any objectionable odor, with the exception of a slight musty smell in the interior of the sludge house, which was not offensive. The plant was much the most successful of its kind visited at that time, and the following advan tages have been noted:

First. High manurial value of the sludge.

Second. High purification of effluent as compared with other chemical works visited.

Third. Small area required for works.

Fourth. Absence of all nuisance.

It is to be remarked that the works were originally constructed for the old A B C process, and were therefore not especially adapted for the use to which they were put, and for this reason it would be useless to go into great detail in reference to their construction. Probably other works of the system since constructed offer better models in this respect. For the same reason cost of the works at Acton would not be a reliable guide at the present time.

CONCRETE ARCH OVER BASSETT'S CREEK, IN MINNEAPOLIS.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

SOLID AND PERFORATED MANHOLE COVERS.

I would like your opinion in regard to solid and perforated manhole covers.

J. T. Postlethwaite,
City Engineer, Paducah, Ky.

As in so many other cases, the question of solid or perforated manhole covers is one which must be answered for the circumstances of a particular case. So far as the sewer is concerned, perforated covers are desirable to secure such ventilation as may be possible, and to relieve any possible excess of pressure on account of sudden formation of gases or change in rate of flow, of water or air. Theoretically, it is probably possible to design a system of sewers that will be self-cleansing, and ventilated sufficiently to remove gases as soon as formed. Practically there are other more important items to be considered, which modify practice and full ventilation is not secured. Small holes such as would appear in a perforated manhole cover are better than large openings, such as untrapped catch basins, because the escaping gases are diluted more thoroughly, and are not so likely to cause complaint from neighboring residents. When such discharges of gas become offensive, it is notice that the sewers are foul enough to require cleaning. On unimproved streets the perforated manholes are objectionable because the dirt drops into the sewer in sufficient quantities to interfere with the flow of water in the sewer, especially on branches where the flow is intermittent and usually small in quantity. A pan is sometimes hung below the cover to catch this dirt. This is desirable on the branches spoken of, as they are near the upper ends of the system and are likely to have accumulations of gas which should have some outlet if it can be secured without too great nuisance. Before a city has reached the stage of advancement when scientific design of sewers and intelligent supervision of construction is demanded, some sewers are constructed which are simply elongated cess pools, and they are producers of much odor. In such cases it is sometimes considered necessary to close all openings and force the gas to follow the sewage to the outlet. Sometimes special forms of ventilating apparatus are used. Some means of escape for the gases should be provided if it is not feasible to reconstruct such defective sewers.

EFFECT OF METER ON FLOW OF WATER.

In placing a meter on a 4-inch or 6 inch water main, how much would said meter affect the flow of water? The pressure is 60 to 70 pounds.

Chas. A. Weeks, Supt., Rouse's Point, N. Y.

The amount of effect of the meter upon the flow of water depends on the design of the meter and the rate of flow, the amount of water consumed per minute. Some of the mutual fire insurance companies in New England made tests a year or two ago of the loss of pressure in various types of meter, and the results are given in a paper by Edward F. French, of Providence, R. I., before the New England Water-Works Association last fall. When the flow of water was at the rate of 500 gallons a minute, two good fire streams, the loss of pressure in passing through a 4-inch meter ranged from 40 pounds to 4 pounds. For six various designs of meter, and for the one 6-inch meter tested was 1.1 pounds.

With a flow of 1,000 gallons a minute two kinds of 4-inch meter showed losses of 25.5 pounds and 16 pounds, the same meters in the former test showing losses of 6.4 pounds and 4 pounds respectively. The same 6-inch meter tested above showed 4.8 pounds loss with the greater quantity. With the moving parts blocked so that they could not move, one 4-inch meter showed an increase in friction of ten per cent., and another of 15 per cent., and the 6-inch showed 20 per cent. increase. Five kinds could be so blocked that they would let no water through.

STANDARD TESTS FOR PAVING BRICK.

Would you kindly inform me what are the standard tests for paving brick? What should a good paver stand in abrasion? What in absorption? And what modulus of rupture shall it have? What formula would you use in determining the rank of bricks in a test? *G. H. Merridith, City Engineer, Cedar Rapids, Ia.*

The National Brick Manufacturers' Association presented for consideration a series of tests which on the whole are acceptable to more engineers than any other series which has been presented. It is also more complete, and may be accepted as the present standard, subject to some future modifications, although the association adopted but one test. This series of tests is described in full, with the reasons for each, on page 154 of the number of MUNICIPAL ENGINEERING MAGAZINE for March, 1897, and page 214, April, 1897, and reference is made to those numbers for these details. They consist, in brief, of the following: The most important is the rattler test, to be made in a rattler 28 inches in diameter and 20 inches long, of specified form of construction, running 30 revolutions a minute. For 1,800 revolutions, 15 per cent. of the volume of the rattler is to be filled with one kind of brick to be tested and with nothing else. The absorption test is not of much value unless extended for long time—48 hours drying at a temperature of 230° to 250° F., followed by 48 hours soaking, was recommended, bricks which have been through the rattler being used, but the association voted to abandon the test as misleading.

Cross-breaking tests are valuable for purposes of comparison, though not subjecting the brick to any such action as it has in practice, and are made by supporting the brick on two knife edges 6 inches apart, rounded to a 12-inch radius, and applying the breaking pressure by a similar knife edge exactly halfway between them, by insensible increments. Hardness should be close to 6. If materially less, the brick would be rejected on other grounds. Some brick are as high as 7 in hardness. Specific gravity has no relation to other tests. These last two are abandoned. Crushing tests should be made on half-bricks loaded edgewise, as in the street, the bearing surface being made true and parallel planes, and the load being applied at a uniform rate of increase. Cross-breaking and crushing tests are made optional by the association. It will be noted, therefore, that the only test insisted upon is the rattler test, and only two others are considered of any value. Good brick will lose from 9 to 18 per cent. in the rattler in 1,800 revolutions, should not absorb much more than 2 to 2½ per cent. of water, and the modulus of rupture will be more than 2,000, sometimes as high as 6,000. There will be variations either side of these figures, according to the standard set for the adoption of brick, on account

of local conditions and materials. According to the foregoing the relative rank of brick is obtained from the abrasion test alone. If all the tests mentioned are used, some such scale as the following may be suggested. Every engineer who reads it will have modifications to suggest. Probably the statement by the committee rejecting all tests but absorption is as satisfactory as any. St. Louis has adopted this specification: Abrasion 60, absorption 20, cross-breaking and crushing 10 each, whether one or all are used.

METHODS OF VENTILATING SEWERS.

Will you please inform me what, in your judgment, is the best method of ventilating sewers? *J. F., Hudson, N. Y.*

As indicated in the answer to the question regarding perforated manhole covers, the best plan is to so design the sewers that they will be self-cleansing. The city in which the questioner resides is located on a hill rising from the Hudson river, and all the main sewers have heavy gradients and high velocity of sewage. Some of the branches at the upper ends of the system are probably rather flat, but it is possible to lay all sewers with gradients sufficient to give self-cleansing velocities. Flush-tanks at the ends of the small branches will keep them clean, and the regular flow of sewage should keep the main lines clean. Under such conditions ventilation is not necessary except to relieve the pressure which is sometimes caused by heavy winds blowing into the mouths of the sewers. This pressure can be relieved by the perforated manhole covers, thus preventing the forcing of house traps. This method of ventilation is the most common in this country, and is usually very satisfactory. Objectionable odors from the manholes give notice that the sewers need cleaning. See the answer referred to above.

Some of the sewers in the city in question are old and were imperfectly constructed of improper materials, so that sewage stands in pools in them and much decaying solid matter is deposited in crevices in the walls. Much sewer gas is thus developed which causes offensive odors nearly all the time, so that the manhole covers would probably not give enough ventilation and would emit unbearable odors, unless much labor and water is expended in frequent cleansing.

The method of ventilation next suggested is that of iron pipes run up above the roofs of houses in connection with the house drains. These are most effective if they are the regular house drain pipes, run through to the roofs without traps, having the advantage of the heat of the house to induce circulation. Many object practically to these ventilating pipes running inside the house on account of the possibility of leakage of joints. The ventilation will be secured, however, if the pipes are run up outside. Enough of these will ventilate the sewers well, removing the gases as rapidly as they are formed and diluting them with the fresh air drawn in at the outlet and elsewhere. Some fresh air inlets should be placed, carefully, so that they will act as inlets and not as outlets. If theory does not locate these points a few experiments will.

Such defective sewers approach English conditions. The sewage in England is more concentrated than in this country on account of the smaller consumption of water. Old sewers of defective design also exist in large numbers. Many plans for ventilation have been

tried. A late report on the ventilation of sewers in Beckenham states that the perforated manhole covers have not been sufficient, and are sources of considerable nuisance. The engineer recommends flushing to keep the sewers as clean as possible with little expense. He then elaborates a system of tall pipes, averaging 600 feet apart, with perforated manhole covers alternating. By carefully locating these the manhole covers will act as inlets and the nearest tall pipes will act as outlets. These pipes are usually 6 inches in diameter and from 20 to 35 feet high, are run up by lamp posts, trees or houses, so as to be as inconspicuous as possible, or are made somewhat ornamental. They cost nearly $50 apiece, including the special construction to collect the gases and deliver them to the pipe. Such constructions would be necessary in this country only in the worst cases. Pans of charcoal so located that the sewer air must go through them in its way to perforated manhole covers are sometimes used successfully in England. The best system is a plentiful supply of clean water properly applied, so as to remove the necessity for regular ventilation. A single defective sewer may pollute the air of a whole system, and in some cases the reconstruction of such a sewer would be more economical than a system of ventilation.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

METHOD OF BIDDING ON STREET PAVING IN INDIANAPOLIS.

Why are bids on street paving in Indianapolis always reported per lineal foot instead of square yard, as in other cities?
J. B.

The above question was referred to Mr. B. J. T. Jeup, city engineer of Indianapolis, whose reply is quoted in full as follows:

To the Editor of Municipal Engineering Magazine:

Replying to your favor of March 30, as to why bids on street paving in Indianapolis are always submitted on a basis of per lineal foot instead of square yard, as in other cities, I wish to say that the city charter provides that bids shall be received in this manner. Section 74 of the charter, referring to street improvements, begins as follows: "The said board shall order such improvement and shall advertise for bids and let the contract for the same; the cost of any street or alley improvement shall be estimated according to the whole length of the street or alley, or so much thereof to be improved as is uniform in extent and kind of the proposed improvement per running foot, and the total cost thereof, exclusive of one-half the cost of street or alley intersections, shall be apportioned upon the lots or lands abutting thereon.

Our city attorneys construed this section that bids should be received per lineal foot of improvement on each side of said street or alley to be improved, including all appurtenances.

Very respectfully,
B. J. T. Jeup,
City Civil Engineer.

PROVISION FOR EXPANSION AND CONTRACTION OF BRICK PAVEMENT.

How would you provide for expansion of the brick pavement upon a foundation of 8 inches of gravel, two inches of Portland cement, the width of the street being 32 feet between curbs?
A. M. Fuller, Meadville, Pa.

It is best, where Portland cement grout is used as a filler, to leave an opening about one inch in width

next to and along the curb on both sides of the street and fill it with an asphaltic cement. This will provide for lateral contraction and expansion. It is wise to fill continuous seams crosswise the whole street, one at about every ten or twelve feet, using asphaltic cement instead of hydraulic cement. The asphaltic cement must be poured into the openings on a dry day, using very hot melted cement. The above arrangement has proved efficacious against injury from expansions and also prevents the loud rumbling so often heard in connection with brick pavements entirely filled with hydraulic cement.

BY WAY OF COMMENT.

The War Flurry and Business.

The people of the United States, naturally sympathetic and excitable, are easily susceptible to the aggravating influences which have brought about hostilities between this country and Spain. Love of contest is so strong within them, as the motive of both pleasure and business, that it is to be expected that they will for a time yield almost completely to the excitement of such an unusual experience as war, but they are too rational and too conservative in their regard for their business interests to permit serious or unnecessary disturbance of prosperity by a flurry such as they are now indulging. Whether the war with Spain is ended in a few weeks or continues indefinitely, a little calm consideration will easily convince one that it need not disturb the internal business of the United States. The country is to-day in a more prosperous condition than at any time since 1892. The flush of plenty and high prices is on the country, with a market of greater absorbent capacity before it than ever before. The flow of gold is steadily and increasingly toward this country instead of from it, and in the midst of all feverishness the prices of American securities have been maintained unyieldingly above the level of 1896.

Consumption of both natural and manufactured products will be increased rather than diminished, and the tendency of prices will be towards an advance rather than a decline. It is not likely that a bankrupt, feeble and degenerate country like Spain can inflict appreciable injury upon the great and unconquerable United States. Spain's war in Cuba has caused us greater commercial loss than will result from its open war on our country.

The impotency of Spain in its warfare with a few thousand poor Cubans makes its resistance to the most powerful country in the world a hopeless, if not absurd pretense, which can not be long continued, and will inevitably result disastrously to the Spaniards. In the meantime, the people of the United States should not permit themselves to be misled by sensational newspapers into taking the affair too seriously. It is certainly not a

sufficient cause for the disturbance of general business. England is almost continuously engaged in quite as serious warfare in some part of the world without appreciable effect upon its business affairs. It is possible to allow only a comparatively small number of American citizens—less than one per cent.—the opportunity of participating in the settlement of the Cuban question, and the rest should waste little time on "yellow newspaper" bulletins.

It is gratifying to note that there has apparently been little or no disturbance of business activity in the municipal field. There is quite as much improvement work in prospect and under way in American cities as usual. The news departments of this magazine, giving the latest information regarding improvement work, show that preparations are in progress for an active season, and that municipal officers are not neglecting their duties in pushing the work of making their cities physically better.

A Form of Municipal Control of Water-Works.

The city of Ottawa, Ill., will secure municipal ownership of water-works by an interesting process, since the city could not bond itself for the amount necessary to construct a complete system without passing its constitutional limit of indebtedness. A franchise was granted to the company which would build the works designed and supervised by the city authorities for the lowest price, the franchise providing that the works should be paid for by the city in twenty annual payments according to a fixed schedule. The plant is operated by the company during the period of the franchise, and the net revenue is paid into the hands of a trustee to be used in meeting the annual payments of the city. Should the net revenue not be sufficient to make the whole payment the city pays the remainder out of its general funds. As the annual payments towards extinguishment of the debt, and the interest on it, are about $8,700, that is the maximum that the city can be called upon to pay in any year. No money can be drawn from the revenues to pay taxes on capital stock or for payment of salaries to any one not actually and necessarily employed in and about the operation of the plant in the city, so that the net revenues can not be reduced by high salaries to officials. Even if the city must pay the entire $8,700 each year it is not paying an exorbitant hydrant rental, and will own the works at the end of twenty years. Extensions are paid for by the city. The bid for the franchise was $160,000, of which $60,000 was paid in cash and $100,000 was the debt to be extinguished as stated. The items which can not be charged to the revenue account, interest on stock, or whatever form the company's capital takes, and the profits of the contract, are included in the $160,000 bid. While the construction could have been carried through by monthly cash

payments at a less figure, the amount bid is considered a reasonable estimate of the value of the plant, and the process enables the city to secure complete works at once instead of constructing works with annual additions as the cash could be raised, after the $60,000, which could be raised by bonds, was expended.

There has been some question of the legality of this method of procedure, but it has not been carried to the courts in Illinois. The decision quoted on page 221 of the April number of MUNICIPAL ENGINEERING is to the effect that a process similar in some respects is not deemed to be strictly according to law in Indiana. In Ottawa it was considered that if the $8,700 annual payment may be treated as a hydrant rental, the $100,000 and interest which the city agreed to pay by twenty such annual payments was not a *bona fide* addition to the bonded indebtedness of the city, but was rather in the nature of a contract for services such as every city enters into which contracts with a private water company for hydrant rental. Money under such a contract is not due until the services are rendered. The addition of the proviso that the works should become the property of the city upon the completion of the twenty payments, and a further payment of $100 was not held to modify this view of the contract materially.

It will be seen that in many points, this process is similar to that presented by Mr. A. F. Potts' paper on "A Successful Substitute for Municipal Ownership," in the April number of this magazine. The fundamental principle is different, the intention in one case being to secure municipal ownership, and in the other to obtain a substitute for it. Therefore, at Ottawa the franchise could be let to the lowest and best bidder, while in the other case the original trustees and their board of directors must be depended upon to secure the lowest cost compatible with good work. The works are transferred to the city when the cost of construction and interest are paid, leaving the city to consider the matter of reduction of rates when these annual payments are no longer to be met. The question for decision in each particular case is, whether direct control of the works by the city officials or by the board of trustees, appointed as provided in the process presented by Mr. Potts, is preferable. No general rule can be laid down. Local circumstances and conditions must receive full consideration and will have their influence in reaching the decision. A right start, by securing the best men in the city for the first trustees, will go far in making Mr. Potts' plan the best continuously. The theory that responsibility brings out the power to bear it, and the theory of our system of government, that the people must carry this responsibility and that we secure the officials who best represent the average of the community, are in favor

of municipal ownership. The unquestioned economic value of permanency of management is a very strong argument for such a method of control as Mr. Potts proposes. When its great economic value is fully recognized we will see more examples of its application in municipal affairs.

Growth of the American Cement Industry.

The enormous growth of the Portland cement industry in the United States in the last decade has materially changed engineering practice in the use of cements. We have now thirty factories which make more than 2,250,000 barrels a year. About two and a half million barrels were imported in 1895, and the importations are not far different now, while domestic production has more than doubled. The increase in the production of domestic Portland cements has increased with the demand for cement. They are now made in many states in the Union, especially Pennsylvania—which produces more than half the Portland cement made in the United States—New York, Ohio, Indiana, Michigan, Illinois, Wisconsin, Minnesota, with smaller quantities in several other states. These cements are of all grades from those which are really selected natural rock burned with care, to those which are equal to or better than the best foreign brands. The committee of the American Society of Civil Engineers has no small task before it to prepare a series of tests which will show clearly the variations in the products of the many processes of manufacture, and qualities of materials used. True economy will take into account the relative strengths and prices of various cements. The question of transportation charges will be one of increasing importance as the discovery of new sources of raw materials is extended into new fields. Careful differentiation of values will become more necessary. Hence the necessity of close study of all sides of the question in selecting series of tests, and the desirability of more breadth of treatment than is indicated in the series of questions asked engineers and cement experts by the committee.

There is room for two or three doublings in amount of product before this country takes equal rank with Germany in the production of Portland cement.

It is probable that no association of cement manufacturers can be formed in this country that will have so great an influence on the methods of manufacture and the quality of product as the German association has for the reason that the variety in materials and the consequent variety in processes is greater. The extent of territory is vastly greater also, and the question of freight rates will have a greater effect in determining the use of particular brands. For this reason it is most essential that the standard methods of test be so scientifically determined that, while allowing full latitude for choice of

materials and methods which will produce good cement, they will at the same time be strong enough to detect, with as small a percentage of error as possible, the cements which are not of sufficiently high quality to perform the duty required of them in any particular case.

Large production, competition and reduction in freight rates on account of wider extension of location of factories is reducing the price of Portland cement so that it is rapidly displacing the natural cements in important work and is also restricting the use of natural cements to the neighborhood of the factories. The overshadowing importance of Portland cement is indicated by the omission of mention of the distinction between natural and artificial cements and the implied restriction of the inquiry to the higher grade to a large extent. However, the natural cements should not be neglected, for their production is very large and their uses are very important. Their differentiation should be carefully provided for in the tests recommended by the committee. Without doubt those interested in the use of natural cements will see to it that the committee does them full justice.

Standard Cement Tests. The questions asked by the committee of the American Society of Civil Engineers on standard cement tests regarding tensile strength, follow the same general principles shown in the preceding questions discussed in these columns last month, and the same modifications are suggested, as elaborated in what follows. The proportions of cement and sand in tests is asked for (Question No. 42), the answer, doubtless, to contain statements of the reasons for different proportions under different circumstances, as a single mixture is used by very few engineers, many preferring several different proportions for purposes of comparison. The reasons for the proportions adopted would be more certain to come if they were called for directly. The old form of briquette adopted by the Am. Soc. C. E. is assumed as the standard, and reasons for deviating from it, if any, are requested in 43, the basis for these reasons being given in the answer to 44. The steps in making are brought out in (45) the surface on which they should be made, (46) should they be traveled on both sides, (47) consistency of mortar, (48) method of filling molds and use of machine, (49) personal experience with machine, if any. The treatment of briquettes in the first twenty-four hours is asked for in 50, and for the remainder of the time till tested in 51, the much discussed questions of renewal of water and degree and constancy of temperature being asked in 52. Reasons for difference in practice for different purposes are called for a little more definitely than usual in the series in 53 which asks the age at which briquettes should be broken for acceptance tests on ordinary work,

and in 54, which asks when longer time tests are essential. As suggested before, the detailed reasons for differences in practice, on account of differences in the character of work demanded of the cement and in the character of materials, would be brought out better if these questions were somewhat more extended. Question 55 asks if the weight of the briquette will give any information of value. The form of clip (56) and the distance between gripping points of the same clip are asked for (57), but no special questions are asked as to form and nature of bearing surfaces. Precautions for uniform bearing and center pull are asked, although these are questions which have received much attention, and are still far from receiving uniform answers. This seems to be a serious omission. Those who have paid special attention to these points have an opportunity to elaborate on them, however, in the answers to the questions just stated and to (58) the rate of applying the stress, (59) style of testing machine preferred, (60) desirable modifications and (61) special precautions necessary in breaking briquettes.

Tests of compressive strength are apparently not yet considered to be of great value, and are disposed of in a very few questions: (62) Are compressive tests advised and why? (63) form and dimensions of test pieces? (64) differences in manipulation from tensile specimens, if any, and why? (65) method of preparation of specimen for the machine? (66) form of machine? (67) rate of applying stress?

Tests of transverse strength are disposed of quite as briefly: (68) Under what conditions and why should binding tests be used, if at all? (69) form and dimensions of test pieces, and span? (70) differences in manipulation from tensile specimens, if any, and why? (71) form of testing machine? (72) rate of applying load?

Both of these series of questions are rather meager probably because the members of the committee are not convinced of the value of these methods of test. In gathering information and opinions for consideration in preparing a report it is well to secure abundance of material, and it would have been well to secure a first draft of these two series of questions from engineers who go to extremes in asserting the value of these methods of test, the questions being worked into form by the committee to conform to its general idea.

Opportunity is given in a supplementary answer to give the conditions under which tests for adhesion, abrasion, resistance to freezing and resistance to the action of sea-water are necessary or desirable, and the manipulation recommended. Other special conditions are not mentioned nor is there an omnibus question under which the *et ceteras* may be collected. Since engineers are not usually noted for volunteering information they are not likely to add information in their possession in unusual lines.

Some Newspaper Criticisms of Engineering Work.

Some of the Kansas City papers are trying to make political capital out of misrepresentations of the operation of the municipal water plant in comparison with the operation of the plant under private ownership. They are not able to show a deficit, and are obliged to admit a handsome profit, but by juggling with the figures to reduce the profit to as small an amount as possible, and then comparing it with a statement that the private company was able to earn exactly 6 per cent. on the company's estimate of the value of the plant ($4,178,000), they claim a reduction in the profits of about $57,000 a year. After considerable litigation and much offering of evidence as to the value of the plant, the city purchased it at an assessed valuation of $3,150,000. Six per cent. on this sum is more than $57,000 less than 6 per cent. on the company's estimate of the value of the plant. The indefiniteness of the standard of comparison is evident and the force of the criticism is broken by the evident partisan character of the attack. Other similar points could be made.

Similar political attacks are made upon the new water-works management in Cincinnati. So long as these attacks are confined to political manipulations and are made on that basis objection to them from an engineering standpoint is superfluous. However, one of the daily papers claims to have found a hydraulic and civil engineer with years of experience who is willing to lend himself to an attack on the engineering features of the project, and who stoops to the use of partial statements and indefinite comparisons quite as far-fetched as those in Kansas City just noted, the absurdity of most of which can be demonstrated with equal ease, by those acquainted with the facts and who have engineering experience. His opportunity comes in the ignorance of the ordinary newspaper reader of such matters. The newspaper in question is concealing in its anonymous statement a man who does not belong to the engineering profession or an engineer who has no standard of professional ethics but is willing to lend his talents to an attempt to throw discredit upon the character of the professional work of his fellow-engineers, whose standing is among the highest, for the purpose of making a political attack upon the management of the works. The anonymous nature of the attacks shows its lack of basis. Even its author will not stand responsible for it. If he is an engineer we have another example of lack of professional spirit, another reason for continuing the agitation of the question of professional ethics, and perhaps an argument for a method of disciplining an engineer guilty of such unprofessional conduct.

CURRENT INFORMATION.

Annual Meeting of the American Water Works Association.

The annual meeting of the American Water Works Association will be held in Buffalo, June 14th to 16th. President Caulfield says that papers are promised by F. A. W. Davis, S. E. Babcock, John L. Bishop, F. W. Cappelen, William Himron, Chas. Hermany, W. R. Hill, Jno. B. Heim, Chas. F. Loweth, W. P. Mason, Owen T. Smith, M. R. Sherrerd, W. S. Wilcox, P. D. Warner, T. W. Yardley, L. N. Case, Dabney H. Maury, jr., and D. W. Mead, and it is expected that two or three more will be added to the list. President Caulfield says that most of those who have promised papers have not yet furnished their subjects, and therefore the program cannot be announced till later. It has been announced that the headquarters of the association will be at the Iroquois Hotel, though this has not been officially authorized so far as known. Responsibility for the announcement seems to rest with Fire Water, which assumes to pledge the association to arrangements of this kind at the expense of the members. On account of dissatisfaction from previous experiences, the association at the last annual meeting appointed a committee on transportation and exhibits, which, it was understood, would also have charge of hotel accommodations. We are advised that this committee has not yet held a meeting, but expects to go to Buffalo soon to make arrangements. The premature announcement of Fire Water, designating the headquarters and fixing the "special" rates at $4 and $5 per day, has brought out many protests from members, who, as one of them writes, "are not pleased with the assumed authority of the only 'water works journal.' It is hardly right to have the business affairs of the association in the hands of a journal that uses it to advance private interests," a fact which the American Water Works Association is not likely to tolerate much longer, since a rapidly increasing number of its members have come to the conclusion that it "is and ought, by right, to be free and independent."

Methods of Paying for Street Improvements in Different Cities.

A statement has been prepared by Robert E. McMath, president of the board of public improvements at St. Louis, Mo., in which he gives the methods of paying for street improvements in fifty cities. The plan proposed by the council committee on legislation in the charter amendments now before the council, is to base the assessment for street construction on the assessed valuation of the property abutting on the thoroughfare to be improved. The data collected by President McMath shows that this plan is in operation in but one city—Little Rock, Ark. The list compiled by president McMath is as follows:

Portland, Me.—City pays cost.

Manchester, N. H.—City pays total cost.

Boston, Mass.—First paving paid for by property according to frontage; payments running through a term of ten years. Renewals by the city.

Lowell, Mass.—Grading done at private expense before street is accepted as a thoroughfare. Improvements paid for by the city.

Springfield, Mass.—All street improvements paid for by the city.

Worchester, Mass.—Grading paid by property; sometimes by frontage rule, sometimes by area. All paving paid by the city.

Providence, R. I.—Streets accepted only after being graded. Improvements paid for by the city.

Hartford, Conn.—Grading done at expense of the city. Improvements charged two-thirds against abutting property, according to frontage, and one-third paid by the city.

New Haven, Conn.—Grading done by the city. For street improvements, the property abutting pays for one square yard for each running foot front, for original work, and for three and one-half square feet in cases of renewal.

Albany, N. Y.—Grading paid by contiguous property, by frontage rule or area rules, as seems most just by Board of Contract and Apportionment. Pavement usually paid for in proportion to frontage, but other method is permitted if deemed more fair. Street intersections are assessed for half the depth of blocks in either direction. Repaving paid by the city, except one-half or more of frontage; petitions for different kind of pavement in such case paid for as if original work. Contractor required by charter to repair from 5 to 15 years.

Brooklyn, N. Y.—Grading and paving usually assessed on contiguous property, 60 per cent. being apportioned in proportion to frontage and 40 per cent. on property within the district, usually one-half block each side of the improved street, according to area. Repaving paid, half by the city and half by the property, according to frontage, excepting streets having street railways, where one-fourth of the total cost is paid by the railway and credited to the proportion payable by the property.

Buffalo, N. Y.—Grading, paving and renewal at the expense of property in proportion to frontage. Maintenance, when replacing one-third of pavement or more is necessary, becomes renewal.

New York, N. Y.—Assessments of improvements levied by Board of Assessors, to whose discretion the particular method of assessment is left. The common practice is to assess for grading and paving in proportion to frontage. Renewals paid for by the city.

Rochester, N. Y.—All improvements paid by abutting property, according to frontage.

Syracuse, N. Y.—Assessments made according to benefits, as estimated by assessor. Usually the assessment is made according

to frontage, the property bearing the entire cost of grading, paving and renewal.

Newark, N. J.—Grading and paving paid for by abutting property, according to frontage. In corner lots the long side is assessed at 65 per cent. of its proportion according to frontage. Renewals chargeable to the property.

Patterson, N. J.—Grading and paving paid by property, according to frontage. Repaving by the city.

Harrisburg, Pa.—Paving and grading charged against property, according to frontage.

Philadelphia, Pa.—Original pavement paid by abutting property, grading by the city; renewals also by the city. Street railways maintain the street paving from curb to curb.

Scranton, Pa.—Grading and paving to be paid by property according to frontage. Contractors keep in repair for five years. Renewals: One-half paid by property and one-half by the city.

Wilmington, Del.—All street improvements paid by the city.

Baltimore, Md.—Grading and paving done by abutting property, according to frontage. Contractors make all repairs for two years.

Washington, D. C.—All street improvements paid for by the general fund, one-half by the United States, the government being considered the owner of 54 per cent. of the area of the city.

Richmond, Va.—All street improvements paid for by the city.

Charleston, S. C.—All street improvements paid for by the city.

Atlanta, Ga.—Grading paid by city. Other street improvements, two-thirds paid by property in proportion to frontage and one-third by city.

Augusta, Ga.—Property fronting improvement pays half the cost, according to frontage.

Montgomery, Ala.—Half paid by abutting property and half by the city.

Jacksonville, Fla.—City pays one-third, the abutting property two-thirds, according to frontage.

Nashville, Tenn.—No special assessments are levied, having been declared void by Supreme Court under the Constitution of Tennessee.

Louisville, Ky.—Total cost of grading and paving assessed upon the contiguous area, usually extending one-half block on each side of the street improved, corner lots paying 25 per cent. more than inside lots. Renewals paid for by the city.

Cincinnati, O.—City pays 2 per cent. of original street improvements and assessments, the remainder by property, according to frontage; but the city prorates as abutting property for the intersection or junctions of lateral streets. Repaving paid under special law of Limied Applicaion, half by the city and half by abutting property; otherwise, renewals are paid for as original work.

Dayton, O.—All improvements paid by abutting property, according to frontage, but the city pays for street and alleys intersections. Contractor maintains for five years. Subsequent repairs and renewals by the city.

Indianapolis, Ind.—All improvements paid by property according to frontage, except that half the cost of streets and alley intersection is assessed against property fronting on the intersecting street or alley, for a distance to the next street.

Peoria, Ill.—Abutting property pays the entire cost according to frontage.

Detroit, Mich.—City pays for grading and for paving street and alley intersection. All other paving paid by property, according to frontage. Repaving paid for by the city.

Milwaukee, Wis.—Grading and paving paid by adjoining property. All street and alley intersections paid for by the city. Repaving done at the expense of the ward, but if a reconstructed pavement has a concrete foundation the expense is borne as if original work, but the property is in that case credited with the cost of the original pavement.

Minneapolis, Minn.—Grading done at the expense of the ward. City pays for paving and repaving intersections. Remainder of cost assessed upon property according to frontage.

St. Paul, Minn.—Total cost of all street improvements assessed upon abutting property, usually according to frontage.

Burlington, Ia.—Grading paid for by the city; pavements by assessments upon abutting property, the city paying for intersections. Alley paving paid by property according to area; repaving by the city.

Kansas City, Mo.—All improvements paid by adjoining property. On business streets property owners may choose between two or more kinds of pavement, selected by the Board of Public Works; on residence streets a majority remonstrance prevents work.

Little Rock, Ark.—All improvements paid for by assessment upon all taxable proprty within the improvement district in each case established in proportion to the value of the property.

New Orleans, La.—City pays one-fourth and abutting property three-fourths of street improvements, according to frontage. Avenues having neutral ground, as at long intersections, one-third is paid by the city.

Sioux Falls, S. D.—Entire cost paid by abutting property the city paying for intersections.

Omaha, Neb.—The city pays one-half the cost of grading. Paving by property in proportion to frontage; city paying for intersections.

Topeka, Kas.—The city pays for grading. Paving is assessed upon property benefited in proportion, determined by appraisers specially appointed.

Salt Lake City, Utah.—City pays one-half the cost of grading and all the cost of intersections. The remainder assessed upon abutting property according to frontage. Street railways pay for two feet outside of rails and between rails of tracks.

Seattle, Wash.—All land, including street areas between termini of the improvements, and within 120 feet of the street line on each side of the street improved, constitutes an improvement district, except that when a cross-street has already been improved its area is excluded. The total of any street improved is divided by the total frontage, including that of unimproved cross-street, and of the rate so determined 40 per cent. is assessed upon property within 30 feet of the street line; 25 per cent. upon the property lying between lines uniformly 30 and 60 feet distant from the street; 20 per cent. upon all property within 60 and 90 feet, and 15 per cent. upon the remaining property from 90 to 120 feet distant. The city pays

the proportion of assessment charged to the street area.

Portland, Ore.—All street improvements paid by property in proportion to frontage, except the cost of intersections, with a special charge upon the two lots nearest the corner, the corner lot being assessed for five-ninths and the one adjoining four-ninths.

San Francisco, Cal.—Grading and paving paid by property according to frontage. Repaving by the city.

Management of Municipal Water Works in Iowa.

The city council of Sioux City, Ia., will attempt to establish the unconstitutionality of a recently enacted Iowa law which takes water works plants in cities of the first class out of the hands of the councils and places them in charge of boards of trustees appointed by the judges of the districts in which the cities are located. Any act is looked on by the people as unconstitutional which deprives the executive department of any city of its rightful privileges and gives them to the judiciary. A committee of aldermen will investigate the new law, and if satisfied of its unconstitutionality will test it in the courts.

Suing a Sewer Pipe Trust for Damages.

Suit against the Union Sewer Pipe company was begun in the United States Circuit Court at Chicago, April 20, by William E. Dee for $76,520. The Union Sewer Pipe company, which is known as the Akron Pipe Trust of Ohio, recently commenced action against Mr. Dee to recover $2,500 said to be due for pipes furnished. Mr. Dee retaliated by suing for damages, basing his action on the federal anti-trust act, which provides than any person damaged in his business by a trust may recover three times the actual damage, together with a reasonable attorney's fee. He claims that in January, 1893, he had sewer contracts on hand that compelled him to use Akron pipes. As he was about to purchase this pipe the trust was formed and he was compelled to pay an advanced price in order to fulfill his contracts. The difference in the price he actually paid for the pipe and that which he would have had to pay had there been no trust amounted, he claims, to $23,840.

Right to Enforce Meter Charges for Water.

An opinion has been rendered recently by the superior court of Pennsylvania in a suit involving the right of a municipality to charge meter rates for water furnished. A brewer, who resisted the payment of meter rates because the premises of every manufacturer in the city were not metered, obtained an injunction restraining the city of Lancaster, Pa., from collecting his water bill, and after several months of litigation the case was decided in favor of the city. The Superior Court affirms the decision of the lower court. The question involved was the right of the city to put in force a schedule of rates by which certain consumers are required to pay a fixed amount irrespective of the quantity consumed and certain others to pay on the basis of the quantity ascertained by measurement and charged for at a certain rate per thousand gallons. The water committee of the Lancaster water works, at its organization, based its schedule of rates upon a fixed annual payment until February, 1895, when a new schedule of rates was adopted by the committee, reported to the city council and approved by that body. Under this schedule certain classes of large consumers were to be charged at the rate of 5 cents per 1,000 gallons, while other consumers were left on a basis of an annual charge without measurement of the actual amount consumed. The new schedule provided, also, "that whenever a consumer prefers to pay the cost of such meter as shall be approved by the superintendent of the water works, together with the cost of putting in and of its maintenance, rather than pay schedule rates, a meter shall be put in, provided that in no case where a meter is used shall the annual charge be less than $10." The brewer, who uses the city water for stationary engines and general brewery purposes, was required, under the new schedule, to pay 5 cents per 1,000 gallons. A meter was placed in his premises and three quarterly bills for the quantity of water used at meter rates were rendered, but have not been paid. The court finds that the charge of 5 cents per 1,000 gallons, as fixed by schedule, is "a fair and reasonable charge." Regarding the legality of the adoption of the new schedule, which, it is claimed, could only be made effective by the Mayor's approval, the opinion says that the water committee already had full power to act, and that its report of its intended action to the city council was for the purpose of obtaining the sense of the legislative body as to the propriety of such action; that neither the city nor the water committee has the right to impose upon the plaintiff nor on all breweries in the city a rate per thousand gallons, meter measure, while permitting other large consumers to pay a fixed schedule. The legislative and municipal requirements that the "rates of prices" shall be uniform and contracts with citizens for the use of water shall be gen-

eral and equal regulations, fitting the occasion and rates fixed by the committee, do not, it is pointed out, demand absolute equality among all citizens in the charge to be made, but repose in the water committee a reasonable discretion as to the amounts to be paid. Water rents are not taxes. There is no obligation on the consumer's part to take the water, but if he does take it he obliges himself to pay for it according to the terms and conditions made public. The supply of water is not a duty of sovereignty. If such power is granted to a borough or city it is a special franchise, made as well for the private emolument and advantage of the city as for the public good. The whole investment is the private property of the city, as much so as the lands and houses belonging to it. "The introduction of water by the city into private houses is not on the footing of a contract, but of a license which is paid for. It may very well be that when a license has been given by the city to the owner of a house to use water, such license may not be withdrawn arbitrarily or from mere caprice. But it is equally clear that the city may adopt such rules in regard to the use of the water and the payment therefor as the municipal authorities shall deem expedient."

No unjust discrimination was disclosed. All users of water in the class of the plaintiff are put upon the same terms as he, and, the price being reasonable, a charge based upon measurement is inherently the fairest. No greater inequality can arise under the new schedule than was entirely possible and more than probable under the old, and while absolute uniformity or equality is impossible, the option given to consumers to pay for the water used on the basis of measurement is the nearest practical approach to it. The fact that the city of Lancaster is charging more than the actual cost of furnishing the water does not relieve the plaintiff from the payment of the water rent for which he has agreed to pay, nor is there anything illegal or reprehensible in the city so operating the water works as to make a profit on them.

Chicago's Intercepting Sewers.

In constructing the intercepting sewerage system at Chicago the old Twenty-second-st. sewer, whose grade was toward the lake originally, will be reconstructed. So as to give a slope of 0.058 per cent. toward the river, a new concrete invert will be put in, the volume of concrete increasing as the river approaches the lake front. The specifications for the reconstruction of this sewer are as follows:

Where less than 6 inches of concrete is shown in section on the existing bottom of sewer, the inner ring of brick shall be removed for 16 inches in width in the bottom. All other parts of the invert, to such point in the arch as the concrete is shown, shall be thoroughly cleansed, first with dilute muriatic acid, second with a solution of potash or concentrated lye, and lastly with water. After the sewer is properly cleansed, the concrete shall be put in place and rammed as specified. Templets of the dimensions shown shall be set and secured, and the concrete shall be brought up just slack of a line or straight-edge set on these forms and thoroughly rammed, and shall be immediately finished with a coat of Portland cement mortar, not more than 0.75 inch thick, of one part cement and two parts screened torpedo sand, floated down truly to the line between the forms, and troweled smooth. Do not drop the concrete from a height when deposited; each stone shall be thoroughly coated with mortar; spread the batch of concrete in a layer 3 or 4 inches thick upon the bottom of the invert, and thoroughly ram with repeated but not hard blows, with a 15-pound rammer, iron shod, until a thin film of water appears on the surface, and all the stones have been driven out of sight, without causing in the mass a gelatinous or quicksand motion, which indicates an excess of water.

The most northerly of these intercepting sewers start at a proposed pumping station on the North branch at Lawrence-ave. and runs 9,015 feet lakeward to Beacon-st. as a 16-foot tunnel; for the remainder of the distance, 3,880 feet, through Lawrence-ave. While the same diameter will be maintained the work will be done in an open cut averaging 29 feet in depth. The most southerly sewer will be in Thirty-ninth-st., with its outlet in the river at Halsted-st. The first 2,070 feet will be a 22x18.5 foot sewer, having a concrete invert and brick arch, which will be constructed in open cut, having an average depth of 38 feet. The specifications provide that the tunnels on the Thirty-ninth-st. and Lawrence-ave. systems must be driven under compressed air, with a shield to be approved by the engineer. Any damage to neighboring properties due to "negligence, carelessness or unskillfulness" of the contractor in the prosecution of his work, must be made good by him. The excavations must conform exactly to the outside of the brickwork, and the contractor will not be allowed to excavate, even in good ground, more than can be lined with brick in a single shift. In case the tunnel is unavoidably larger than the outside diameter of the usual brickwork, the spaces left in this manner must be filled with solid brick masonry of other material as directed by the engineer, by the contractor at his own expense. No extra allowance will be made for quicksand or hardpan. In open, wet trenches, the width of the excavation inside the sheeting, which must be used in

all cuts, is required to be three feet greater than the outside diameter of the work, and never less than five feet. The bottom of the excavation is to have, whenever the nature of the ground will permit it, the shape of the outside of the lower half of the sewer, and to secure this result the contractor must provide a double template in two segments, one to fit the outside and the other the inside of the invert.

After it has been set firmly in position, from which it must not be removed until the masonry has ben laid, the bed of the trench must be brought to the required shape by trimming to a line stretched from the outside of the finished masonry to the template. If the character of the ground prevents excavation in this way, the bottom of the trench must be brought as nearly as possible to the desired form, and "the space between the external sewer lines and the bottom and sides of the excavation so made, for a width equal to the outside horizontal diameter of the sewer at the springing line, shall be filled with brick masonry or concrete as directed by the engineer." The pumping plants which the contractors must maintain on two interceptors are required to have capacities of 25,000 and 40,000 gallons a minute.

All brick sewers 2½ feet or less in diameter are to be one course thick; from 2½ to 6 feet, two courses; from 6 to 9½ feet, three courses. All manholes are circular in section, 3 feet in diameter, with walls of an inside ring of vertical brick and a backing of bats, if desired, the whole to be 8 inches thick. The tops are to be 2 feet in diameter, this decrease being secured by diminishing the diameter of each succeeding course one inch. On unpaved streets, the tops of the manholes are to be 4 inches lower than the surface of the street, and on paved streets one inch lower. The catchbasins are to be 4 feet in diameter, and built like the manholes, on 6 inches of concrete. Each of them is to have a half-trap connection with the 9-inch outlet. The brickwork is to be 7 feet 2 inches deep, and the bottom of the outlet pipe is to be 3½ feet above the bottom of the brickwork.

The system, brief mention of which has been made before in Municipal Engineering, will connect the north and south branches of the river. Pumping stations will be built in connection with the interceptors, and when completed, the city will turn them over to the trustees of the sanitary district.

Some Sewer Flushing Experiments.

A series of experiments, to determine the best method of flushing pipe sewers and the efficacy of flush tanks on sewers of different grades, have been conducted by H. N. Ogden, city engineer of Ithaca, N. Y. In order to afford a variety of grades investigations were made on 8-inch sewers. At the upper end of each was a manhole about 4 feet in diameter, which had a plank held firmly against the end of the sewer. There was a 5-inch opening in this plank which could be closed when desired by a cover. By repeated trials it was found that the rate of discharge through the opening varied from 0.89 cubic feet per second under a 4-foot head in a manhole, to 1.1 cubic feet under a 6-foot head, about the same as comes from the usual flush tank. The capacity of the manhole for each 6 inches of its depth was known, so that a flush of any desired volume could be obtained by filling the manhole to the necessary level through a fire hose from a neighboring hydrant. The effect of the flush was determined by observers at the various manholes along the lines, who marked the depth of the wave which passed them, but made no determination of the velocity of the discharge. Small brickbats and gravel of various sizes, painted so as to be recognizable, were placed in the inverts of the manholes, and the force of the wave was shown by its effect on this material and the extent to which the vegetable growth on the pipes was scoured away. The first few flushes were of 20 cubic feet each, which amount was afterward increased 10 cubic feet at a time to 80 or more cubic feet. The manhole inverts and 5 feet of sewer each way were then scraped clean, or the whole sewer was treated this way, and the flushing was repeated.

A number of experiments were made, the most important of which were on Green, Cayuga and Aurora-sts. On Green-st. the first manhole was 197.7 feet from the dead end and the connecting sewer was on a grade of 1.31 per cent. A 0.52 per cent. grade existed between this point and the second manhole, which was 529 feet from the dead end and a 0.524 per cent. grade to the third manhole, 819 feet from the end. It was found that a flush of 25 cubic feet would scour clean the first and second manholes on this line, but it required 60 cubic feet to start most of the small gravel in the third manhole. Two flushes of 25 cubic feet each were required to carry gravel from the dead end to the first manhole, but the gravel scoured from that manhole was not brought to the second until an 80 cubic foot flush was employed, and no gravel scoured from the second manhole was carried to the third at any time. After the sewer had been scraped clean the flushes carried the gravel about 200 feet further. The sewer in Cayuga-st. was found to be in a foul condition owing to a heavy

vegetable growth. This distance from the dead end to the first manhole was 320 feet and the grade 0.89 per cent.; between the first and second manholes a 0.5 per cent. grade and 636 feet from the dead end; from the second to the third manhole a 0.6 per cent. grade and 895 feet from the dead end. A flush of 30 cubic feet scoured the first manhole clean, but the second manhole was only partly scoured with a discharge of 60 cubic feet, and it required 80 cubic feet to clean it. In the Aurora-st. sewer the first manhole was 177 feet from the dead end, with a 3.14 per cent. grade; to the second manhole there was a 1.28 per cent. grade, and was 557 feet from the dead end; the third manhole had a 1.02 per cent. grade and was 970 feet to the dead end. The pipe, which was chiefly from a hospital connection at the upper end, had a large vegetable growth and was foul. A discharge of 40 cubic feet cleaned the first and second manholes, but a flush of 80 cubic feet showed little effect on the third manhole.

The general deductions drawn from these experiments by Mr. Ogden are that flushing of some sort is required at the upper end of laterals, the frequency and amount depending on the grade of the sewer and the sewage reaching it from adjoining premises, as well as influences more difficult to define. He believed that, as a rule, flushing can best be accomplished by automatic tanks unless an intelligent, careful man is placed in charge of the hand flushing. On grades of less than 1 per cent. the volume of the flush should be at least 40 cubic feet, and on flat lines it is believed a second tank, about 800 feet from the first, will give better results than a discharge of 120 cubic feet at the dead end. Mr. Ogden considers that a tank of 15 to 20 cubic feet capacity on grades above 1 per cent. is ample. He prefers, however, occasional hand flushing under such conditions, and believes that an automatic flush from any tank once every 24 hours is ample.

Taxation of a Water Company's Franchise.

An opinion rendered by Judge Johnson in the district court at Denver, Col., April 11, says that franchises are taxable in Colorado. The opinion was brought out by the Denver Union Water company appealing from the decision of the county commissioners. After the company had returned its schedule Assessor Ames added $2,000,000 for franchise, which the commissioners reduced to $300,000. It was from this decision of the county board that the company appealed. Judge Johnson says the contention of counsel that "this alleged franchise is a contract right and is no more subject to taxation than ordinary private contracts between individuals" is untenable when examined in the light of the contract with the city, for this contract not only contains private obligations, but also requires public duties. It was contended also that "franchises are not taxable because the law has not particularly pointed out and designated them as property on the taxing schedules." The judge says that "while there is no express statute on this particular subject, yet I find that franchises of railroad companies are assessed and taxed by the state board of equalization, and if it is proper to tax franchises relating to railroad companies, it certainly would be right to tax franchises of this company, which is of the same quasi public character; otherwise there would be unjust discrimination." As to the claim by counsel that "it is impossible to fix a just valuation upon this kind of property without some statutory regulation thereon," the court says he knows of no law on the statute books that provides how any particular class of property shall be valued outside of its estimated cash value in the markets, based upon information by those who assume to know something of its value; that in a contest between the taxpayer and the public the value of property is not susceptible of proof by legitimate evidence; then, of course, it has no value and is not subject to taxation. Regarding the claim of counsel that "there is no remedy by which this tax can be collected in case a default is made in the payment thereof," he says, if this is so, it is the misfortune of the state in having to lose the tax, but this does not exempt the company from listing and valuing all of its taxable property, the same as other individuals and corporations.

A Remedy for Electrolysis.

The American Water Works Association's committee on electrolysis, of which Mr. F. A. W. Davis, vice-president of the Indianapolis Water Company, is a member, acting under instructions of the association at its last annual meeting, has prepared a report on the action of electrolysis on water pipes that will be an interesting and valuable presentation of a very important subject. The report will be forthcoming at the next annual meeting of the association. The most interesting feature of the report will be a plan which it proposes for reducing to the minimum the damage that is constantly being done by electrolysis.

The remedy proposed will be as follows:

First, that a section of the water pipe be scraped and polished until it is very smooth and then that an iron clamp be fitted around it as tightly as possible. The jaws of the clamp are to be riveted together securely with a copper rivet and a connecting wire of copper will be fastened one end to the rivet and the other to the street car rail. These connections are to be made at as frequent intervals as scientific tests demonstrate the amount of current on the pipes. The result is obvious. The electrical current would be enabled to follow the track or the pipe according to which offers the least resistance, while the perfect copper connection would enable the current to pass from the underground pipe without damaging it in the least. After much discussion the committee has reached the conclusion that the damages, while incapable of being obviated, could be reduced to a minimum by following out this plan.

Litigation Between Paving Companies

Argument in the suit of the Buckeye Paving company of Kentucky against the Union Paving company of New Jersey and William L. Breyfogle of New Albany, Ind., was heard by Judge Baker of the United States court at Indianapolis, Ind., April 25. The suit involves a judgment for $60,000, secured by the plaintiff in 1893 against the Union Paving company in the New York supreme court. The action is brought to compel William L. Breyfogle, who, it is alleged, owes the Union Paving company a large amount of money for stock, to pay into the United States court the amount of the judgment, the New Jersey company being insolvent. The defendants claim that the judgment was procured by a collusion between the Buckeye Paving company and some of the officers of the New Jersey concern, while Breyfogle contends that the evidence fails to show his indebtedness to the Union Paving company. After hearing the argument Judge Baker gave the litigants thirty days in which to file their briefs of facts and law.

Treatment of Sewage by Chemical Precipitation.

At a recent meeting of the Connecticut Civil Engineers and Surveyors Association, J. K. Wilkes, member Am. Soc. C. E., described the experience in the management of the plant for the treatment of sewage at New Rochelle, N. Y., by chemical precipitation. He said that when the works were first placed in service no chemical treatment was employed, as the amount of sewage received was small and sedimentation effected a satisfactory degree of clarification. As the number of house connections with the system increased it was found necessary to commence the lime treatment, to which copperas was afterward added. Experiments were made with aluminoferine, but better results were obtained with lime and copperas at a smaller cost. At first considerable difficulty was experienced in keeping the lime in proper condition, owing to its tendency to settle quickly at the bottom of the lime tank. In making the first attempt, to secure good mixing was made with perforated pipes in the bottom of the tank, through which water was forced under a pressure of about sixty pounds per square inch. Considerable agitation was created by this arrangement, however, and failed to prevent the precipitation of the lime. Two revolving fans are now being employed, each consisting of a couple of blades at right angles to each other, which are given a pitch like a fan or propeller. These are submerged in the lime tank and driven by a Backus water motor. The water from the motor is discharged into the lime tank, and the overflow from the latter passes into the mixing channel. A single fan agitator has been placed in the copperas tank. While this apparatus is not perfect, it is considered a success. It will furnish with but little attention a continuous and fairly uniform mixture of lime and water for about three hours, after which time the large lumps at the bottom must be broken up or replaced by fresh lime.

No measurements have been made of the volume of sewage reaching the works, but about 400,000 gallons in twenty-four hours is believed to be the average amount. The addition of 3.5 grains of copperas and 5.5 grains of lime per gallon of sewage gives a clear, colorless and odorless effluent, which has little or no tendency toward further decomposition.

The best results are obtained when just enough lime is added to make the mixture of sewage and copperas alkaline. This condition is easily detected by adding a few drops of an alcoholic solution of phenolphtalein to the mixture, which turns red when the proper amount of lime has been added.

The sludge is removed from the precipitation beds at intervals of one or two weeks, according to the season, and spread on drainage beds to dry. The transfer is done by means of a centrifugal pump, primed by a steam ejector, no foot valve being used at the end of the suction pipe. Each of the two drainage beds measures twenty-two by seventy-four feet, and has about sixteen

inches of screened coal cinders underdrained by tiles, the effluent from the tanks passing back to be treated again with the new sewage. The beds have to be renewed from time to time, because the cinders are taken off with the dried sludge. This removal is done free of charge by the neighboring landholders, who use it as a fertilizer. About 1,200 cubic feet of sludge is pumped from the settling tanks to the beds every week during the winter and a larger quantity during the summer, and this mass shrinks to about half its original volume after it has been drained.

But two men are employed to run the plant, and last year the cost was $2,700, a part of which sum, however, should not be charged to operation alone. The cost is estimated to be by Mr. Wilkes about 50 cents per capita annually to treat the sewage now, but if the population were greater the cost would be reduced to 35 or 40 cents per capita.

Convention of Asphalt Paving Superintendents.

A convention of the superintendents of the Barber Asphalt Paving company in charge of the work of the company in different cities was recently held in New York, for the discussion of subjects pertaining to their duties, and to promote the esprit du corps which has been an important factor in the growth of the company. The convention closed with a banquet tendered by the company. Toasts were responded to as follows: "Buffalo as an Asphalt Training School," H. J. Warren; "The General Officers," C. O. Warren; "The Speediest Voyage on Record," J. M. Wright; "The Personal Equation," Clifford Richardson; "The Crescent City," Geo. Denegre; "The Superintendent as a Politician," Frank P. Mullen; "The Ladies," A. H. Cranty, Jr.; "Our Allied Companies," F. J. Warren; "The Shops as the Superintendent's Safety Valve," W. Grant King; "Our Absent Brothers," H. R. Kasson. No speaker was allowed to know in advance the toast to which he was expected to respond. It is expected that, aside from the pleasure of such meetings, the superintendents will derive much benefit from them, and the company will gain from them better work at less cost. Other meetings will be held.

Strength of Concrete with Different Aggregates.

In his annual report for the last fiscal year Captain Wm. M. Black, Corps of Engineers, U. S. A., Engineer Commissioner of the District of Columbia, gives some important experiments on the influence of differences in the aggregates used with the same mortar to form concrete. The experiments were made with the assistance of A. W. Dow, inspector of asphalts and cements, and I. H. Woolson, in charge of the mechanical laboratory at Columbia University. In making the experiments the Round Top natural and Atlas Portland cements were used. Enough of the ingredients were mixed each time to give 2 cubic feet, and the concrete was made in 1-foot cubes without special care to secure exceptions. The manner of mixing was as follows:

The damp sand was first thoroughly mixed with the dry cement, after which sufficient water was added to make a plastic mortar. This mortar was mixed with the aggregate, which had been previously sprinkled, by turning over with a shovel until every stone was thoroughly coated with mortar. The concrete was then shoveled into the molds, care being taken that the coarse and fine stone should remain evenly distributed. The molds were filled to a depth of 4 inches and lightly rammed, this operation being continued until they were filled. The ramming was done in moderation, just sufficient to settle the concrete and bring mortar to the surface.

The cubes were wet twice a day until they were tested. The natural cement used in these cubes had 14 per cent. retaind on a 100-mesh sieve, began to set in 20 minutes, and was hard in 36 minutes. At the end of one day its tensile strength was 96 pounds per square inch, and at the end of 7 days it was 180 pounds. The Portland cement had 8.5 per cent. residue on a 100-mesh sieve, and its initial set occurred at the end of 3 hours and 10 minutes, the hard set being 1 hour and 55 minutes later. Its net tensile strength was 441 pounds after one day and 839 pounds after seven days. The tensile strength of these cements in various mortars was as follows:

Class of Cement..	—Natural—		—Portland—	
Grade of Sand	Standard.	Ordinary.	Standard.	Ordinary.
Ratio, sand to cement	2	2	3	3
Age:				
7 days	91	46	248	256
1 month	188	103	429	401
3 months	327	247	398	465
6 months	414	...	428	486
1 year	485	340	474	493

The sand used in the concrete weighed about 90 pounds per cubic foot when damp. The sieve analysis gave residues in percentages on screens of different meshes per lineal inch as follows:

Mesh	3	6	8	10	20	40	60	80	100
Residue	0	7.5	7.5	13	30	32	7	2	0.5

The broken stone used in the aggregate was a gneiss, and the gravel was a clean quartz material dredged from the river. The mortar used in the tests was mixed in the proportion of one part cement to two parts

of sand by volume, and the variation in the concrete was produced by changing the parts of gravel and broken stone. All concretes are considered to be made of eight parts, the mortar forming three in every case. The 10-day cubes were crushed on an Emory testing machine at Columbia University, and the remainder on a 600,000-pound hydraulic press at the works of Watson & Stillman, New York City. The press, being roughly calibrated, was found to give results 3.7 per cent. too high, and a subsequent more careful examination shows that 8 per cent. is a fair maximum. As comparative, not exact results, were desired, the figures in the following table have not been corrected. The figures for 1-year cubes are averages of five tests, and all others give the mean of two tests. The table is as follows:

Strength of Concrete with Different Aggregates. The Natural Cement Mortar was mixed 1:2, and the Portland Cement Mortar 1:3.

Cement.	Parts in Eight Parts Concrete.		Ratio of Void in Aggregate to Mortar (Void = 1).	Crushing Strength, Pounds per Cubic Foot.				
	Gravel.	Stone.		10 days.	45 days.	3 months.	6 months.	1 year.
Natural	..	6	0.839	32,900	77,687	54,022	114,412	131,700
"	3	3	1.070	15,500	52,362	85,315	90,935	121,100
"	2	4	1.006	.....	.....	.....	.....	131,700
"	..	6	0.962	.....	.....	.....	.....	115,200
"	6	..	1.291	12,500	60,452	51,980	49,437	109,900
"	..	6	0.839	.....	.....	85,880	.....	119,300
Portland	..	6	0.839	130,750	{343,520 / 172,325}*	324,875	361,600	440,040
"	3	3	1.070	136,750	263,962	.....	298,037	396,200
"	2	4	1.006	.....	.....	.....	.....	408,500
"	..	6	0.962	.....	.....	.....	.....	388,700
"	6	..	1.291	99,900	234,475	385,612	265,550	405,700
"	..	6	0.839	.....	.....	234,475	220,350	296,300

* Owing to the great variation in these results both are here given.

A. W. Dow, in a special report on the tests, summarizes the results in the following: "In examining the results of these tests it is evident, especially with the natural cement, that gravel makes a much weaker concrete at the start than stone. This was also strongly manifested in the handling of the cubes for the 10-day test; the greatest care was necessary to prevent the edges and corners being broken off those cubes containing gravel, while the all-stone cubes were much more durable. Disregarding the three and six months tests, which appear unreliable, it is very evident that the strength of the gravel is gaining on the stone concrete, and will in time, I believe, pass it. From these tests, if we disregard the cost and are working for strength only, it would seem that the kind of aggregate to use should depend entirely on the class of work. If the work is of such a character that the concrete will be subjected to as much strain during its first month as it will ever receive, the aggregate should be of stone alone, when natural cement is used, and stone or a mixture of stone and gravel when Portland cement is employed. Gravel alone should be used as an aggregate with natural cement in concrete only when its maximum strain will be received after a year. In the case of Portland cement, however, gravel alone may be used in concrete receiving its maximum strain after three months."

Asphalt in New York City.

The consulting engineer of the New York Board of Public Works attributes the success of asphalt not only to its comfort and cleanliness, but to the further fact that the material has demonstrated its fitness for streets having "the heaviest traffic." He says the carters who once objected to asphalt, have changed their minds because they have found that much heavier loads can be carted with greater safety. He asserts that an asphalt pavement can be laid so as to require little or no repairs for five or six, or even fifteen years.

No Restriction on Cutting Into Newark Pavements.

Mayor Seymour of Newark, N. J., has decided that the enforcement of the restrictions for laying pipes or conduits in a street for five years after paving and repaving is impracticable and without lawful authority and with that view has vetoed the resolution.

Durability and Cost of Brick.

A letter from a friend of brick pavements calls attention to a recent report by the new commissioner of public works in Peoria, Ill., M. W. Manning, comparing asphalt and brick pavements. The comparison is to the advantage of brick in points of durability and cost. The commissioner advocates the use of the "small commercial brick, which can be thoroughly burned and vitrified so as to resist all

changes of temperature and without crumbling from heavy hauling."

Wheelmen Object to Excessive Street Watering.

The wheelmen of New York City have renewed their protest against excessive watering of the streets, and, as a result, the Street Sprinkling Association has promised to use a sprinkling apparatus which, instead of flooding the streets, will simply lay the dust. On asphalt streets where there is much bicycle riding, a strip of pavement will be left unsprinkled for the use of the wheelmen.

Municipal Reports.

Annual Report of the City Engineer of the City of Minneapolis, Minn., for the year 1897. By F. W. Cappelen, member Am. Soc. C. E., City Engineer.

Mr. Cappelen reports that difficulty was encountered in arranging for paving brick for last year's work. The most acceptable, though not the lowest bid, was submitted by the Purington Paving Brick Company, which was the only company offering to give a guarantee to replace defective brick for a period of ten years. The price of the Purington company was $15.54¼ cents per thousand, equal to 87 cents per square yard. The supply bought from them filled 198 cars. Mr. Cappelen says: "These brick were the most uniformly burned lot of brick I have ever seen." The small brick (size 2½x4x8) were used, except for a small part of the work, where new blocks (size 3x4x9), which are being manufactured more largely this year, were given a trial. To obviate trouble in the "buckling" of brick pavement, due to expansion and contraction caused by changes of temperature, a half-inch expansion joint, extending across the roadway from curb to curb, was placed about every 150 feet. This joint consisted of California asphalt and maltha. So far, Mr. Cappelen says, this has given excellent results. The pavements were laid by the city with a force of sixty-five men. The minimum payment for labor was $1.75 per day. The detail cost of the work was as follows:

Removing old paving	$0.035 sq. yd
Grading	0.032 sq. yd
Concrete	0.467 sq. yd
Planking, concrete, lumber and miscellaneous	0.008 sq. yd
Brick	0.870 sq. yd
Hauling	0.038 sq. yd
Cushion	0.018 sq. yd
Laying brick	0.032 sq. yd
Murphy grout	0.175 sq. yd
	$1.675 sq. yd

Mr. Cappelen estimates that the saving of the city by doing this work by day's labor was $5,400.

The only asphalt pavement on which the guarantee has expired is seven years old, and the total expenditure for repairs last year was $47.50. As this extends over 30,000 square yards it makes the total cost per square yard about $.0016, which Mr. Cappelen considers "a very good showing." The principal cost of the year's repairs to asphalt pavements, Mr. Cappelen thinks, was "the excessive and unnecessary and not justifiable street sprinkling." It was in the ward where there was the largest use of water on the streets that the greatest amount of repairing was done. Most of the present street sprinklers are old and out of date. Mr. Cappelen repeats in his report his suggestion regarding a municipal asphalt plant, which has heretofore received attention in this magazine.

The sewer construction during the year comprised 3.221 miles, at a cost of $53,924.89. Petitions are on file for additional sewers, estimated at $327,007. The expenditures for bridges amounted to $34,118.

The improvements in the water works system occupied much of the attention of the engineer and his force during the year. The reservoir and the main pipe lines to the North Side pumping station were completed. The specifications prepared for this work are set forth, and full details are given, together with a number of fine illustrations, some of which are reproduced in this number of Municipal Engineering. The tests of coating for the pipes were reported to the American Water Works Association at its last annual meeting, and were given in this magazine at that time. In the laying of the 50-inch steel mains 500 men were employed, in addition to two steam shovels, two air compressor plants and one pumping engine. In one day 1,120 feet of pipe were laid, a record believed to be unequaled. Usually two 28-foot pieces of pipe were riveted together and lowered in 56-foot lengths into the ditch. One attempt was made to lay 112 feet at once, but it was found not to be economical, as it required too many men to handle the pipe. During this year, Mr. Cappelen says, provision should be made for at least two pumps, each of 10,000,000 gallons capacity, to be placed at the North Side station. The estimated cost is $115,000. The filter question can hardly be taken up till next fall, but it is of pressing importance, as the typhoid mortality in Minneapolis is very high. The statistics accompanying Mr. Cappelen's report occupy about fifty pages, and are very complete.

Report of the City Engineer to the City Council of Des Moines, Ia., for the term of 1896-98. By Lafayette Higgins, C. E.

The good work done by Mr. Higgins during the two years he occupied the position of city engineer of Des Moines is fully reviewed in this report. The record is a creditable one, and it is regrettable that for no reason better than the mutabilities of politics he retires from the position. Referring to the deplorable fact that Des Moines is one of the benighted cities where engineering is placed on a political basis, the report says:

"It would have been better for the city of Des Moines, and would have proved a saving of many thousands of dollars, if the office of city engineer had never been allowed to become a political office, where the aspirant must be elected by the direct vote of the people. The effect of this has been, and, it would seem, will be in the future, to bring the office down to a level with other political offices. The city engineer should be a man well educated in the profession, in all the engineering lines that are needed in municipal work, and likewise be an engineer of some practical experience. He should be a man of professional pride, honest, conscientious and fearless in the discharge of his duty. It is needless to say that such men are seldom politicians. No man who feels pride in his profession is willing to compromise himself or his profession in the manner which is so frequently necessary in order to secure and maintain the office, and without seeking to cast reflection upon those who have held the office in the past or who may aspire to hold the office in the future it is simply to state the truth when I say that the city has suffered in its engineering work to the extent of thousands of dollars more than would have been necessary had the office remained upon a high professional plane, where professional men would have it to be. It should not be a question with the people, who can run the office cheapest, but who can run it best. The same rule holds good in the profession of engineering that holds good in the business world; namely, that the best is always the cheapest.

"The idea prevailed in the West from ten to fifteen years ago that the only way to make an engineer was to drill him in the field. This was but the natural extreme as set against the old method of technical instruction without field practice. Years ago technical schools put in about all of the time through four years of training in gathering together all the technical knowledge necessary for the civil engineer, without the necessary field practice. This, of course, left the graduate of the technical school imperfectly equipped for his work. The natural extreme to this was that there should spring up a feeling among experienced engineers that the technical graduate was not competent for his work. Therefore, the man who learned the business in the field was the proper man. Extremes are never safe conclusions. It is conceded today that the proper equipment for an engineer is technical training, which will require from four to six years of schooling in our best technical schools, together with several years of field practice or practical work. There are a number of engineers in Des Moines who possess both these requirements; there are others who have a fair knowledge of engineering, simply from field practice, but who are poorly equipped for the active investigations which now devolve upon the civil engineer in his various lines of work."

Mr. Higgins comments on the defects and the inadequacy of the present sewer system of Des Moines, which is on the combined plan and is no larger than will be required for the sanitary drainage alone in the future. The inadequacy of the present drainage has rapidly become more serious since the improvement of streets in the last two years has facilitated the flow of water, and this will continue to grow with the extension of new pavement.

Brick is the paving material most largely in use in Des Moines, and it is now ten years since the first pavement of this kind was laid. The brick are made in Des Moines, and the quality of the product has been much improved, Mr. Higgins says, in the last three years. "One of the most difficult things to provide for in a brick pavement," he says, "is the top filler. We have tried the tar filler for a number of years. During the year 1897 the Murphy grout filler was tried, and in repair work a Portland cement filler has been used to some extent. None of these fillers are wholly satisfactory, and upon some pavements all have been quite unsatisfactory. The tar filler has the advantage of giving the quieter pavement under traffic; also the advantage of rapidly cementing together any breaks that may occur by reason of upheavals from frost or other causes. It has the disadvantage, however, of becoming very soft at times during the summer and running to the gutters to some extent, and in winter time of readily chipping off under the blows of the shoes of the horses and the wheels of vehicles. The grout filler, if uniformly mixed and properly placed, seems to resist the impact of traffic satisfactorily, but, like the cement filler, it must have a homeogeneous manufacture and preparation, otherwise there are weak places, and at these points the brick soon loosens and the pavement soon begins to fail. From the fact that it is well nigh impossible to get absolutely uniform results with the grout filler, it would seem somewhat more necessary with this filler to keep up a system of repair. Where the grout or cement fillers fail from the causes above mentioned, the repair is quite easily made, and if made early the pavement can easily be placed in perfect condition. The grout and cement fillers are more noisy under traffic than the tar filler."

Mr. Higgins advocates concrete foundations

as preferable, but says that "upon a few streets that have been properly prepared and rolled, two courses of brick work, with a good top filler, has proved a satisfactory pavement." In the future, however, he thinks that there should be no two-course work without some provision for sub-drainage.

The reports of Mr. Higgins of his investigation of the water supply of Des Moines are published in full, together with those of Prof. Charles N. Kinney, the analytical chemist. These are supplemented by diagrams and data bearing on the subject.

Thirty-first Annual Report of the Water Commissioner of Erie, Pa., for the Year 1897:

The report shows an increase of revenues for 1897 of $2,663.67 over that of the previous year. Among the extraordinary expenditures during the year is the item for cleaning and repairing the reservoir, work upon which was begun in June and continued until it was completely and thoroughly overhauled and cemented. Analyses of the water have been made monthly during the year by Dr. William P. Mason and will be continued during the coming year. The intake pipe has been extended to Big Bend, a distance of 8,307 feet. This has been of incalculable benefit to the community, and to this is attributed a reduction in the typhoid mortality from 20 in 1895 to 12 in 1897. The report treats upon the need of some measures to secure the bay from further pollution—either an intercepting sewer or a filtration plant.

Annual Report of the City Engineer of the City of Providence, R. I., for the Year 1897. By Otis F. Clapp, City Engineer.

The expenditures of the engineering department for the fiscal year amounted to $46,601.69, including $44,198.67 for salaries, in addition to which there was paid from special appropriations $12,819.62 for engineering services for the improved sewerage system. During the year 8.916 miles of sewers were built, making a total of 165.289 miles of sewers in Providence. The sewerage work embraced 176 catch-basins, 70 extra inlets and 386 man-holes. The method of connecting lateral mains that are tide-locked with the improved system is illustrated and other interesting details are shown. The records of rainfall and meterological observations, which have been made a feature of the reports from Providence, are continued as fully as heretofore.

Official Report of the City of Augusta, Ga., for the Year 1897:

The message of Mayor Young shows that Augusta has reached the point in its development where it is believed wise for it to have "a commissioner of public works, who should be a skilful engineer and practical man," and action to this end has been taken. The commissioner is Mr. Nisbet Wingfield, C. E., formerly of Atlanta, Ga. The new water works were constructed under the direction of Mr. Wingfield as consulting engineer, at a cost of $292,160, the contractors being the C. H. Eglee Co. and A. J. Twiggs.

Fifteenth Annual Report of the City Water Works of the City of Madison, Wis.

The City Water Works of Madison, Wis., present an instance of successful municipal management. It is fortunately in good hands, as the superintendent, Mr. John B. Heim, is widely known as one of the best water works managers in the country. The Madison plant is now worth, it is claimed, fully three times its cost, which, including all repairs, was $320,581. The original indebtedness of $76,000 for the construction has been reduced to $8,000. In fifteen years the net receipts have been $78,899,36. The company is increasing the use of meters as rapidly as possible, and has thus far spent $38,-008 in this way. To this is attributed its ability to reduce rates. It is stated that in the past the works were "threatened with a continuous fear of shortage of water, but the meters have banished all that." In 1886-7, with 980 consumers and five meters in use, the consumption was 261,308,160 gallons. In 1896-7, with 2,334 consumers and 2,071 meters in use, the consumption was 290,922,750 gallons. The coal consumed in pounds in 1886-7 was 1,124,200 or 1,147 pounds for each water taker. In 1896-7 the total consumption of coal was 1,470,609 pounds, or 630 pounds for each taker. The assertion that as the meter system increases the fuel bill decreases, is verified from year to year by the records. The rates are fixed at a minimum of $2.25 per six months to encourage plentiful use to the extent of one and two-fifths barrels of water a day. The per capita use of water was forty-five gallons per day.

Fifteenth Annual Report of the Board of Park Commissioners of the City of Minneapolis, Minn.

A reduction for the appropriation for park purposes has necessarily restricted the work of the commission, but it will be some larger this year, and this will be applied to the construction of roadways, the opening of cycle paths, the protection of terraces and some dredging and grading. Much additional land is desired by the commission. The president recommends more attention to the planting of shade trees, this to be done, in the settled residence parts of the city, at the

cost of the property owners. Permanent improvements in the parks were made during the year costing $18,023. This work was done under the direction of the city park engineer, Mr. Frank H. Nutter.

Annual Report of the Board of Public Works of the City of Battle Creek, Mich., for the year 1897. S. O. Bush, President.

A strong plea is made by the board for economy in the use of water to enable the city to defer for a few years a probable expenditure of $25,000 for increasing the capacity of the water works system. Battle Creek has a minimum yearly meter rate of $3 and the Board has been able to reduce the waste of water without friction.

Third Annual Report of the Board of Public Works of the City of Little Falls, N. Y., for the year 1897.

The principal feature in this volume is the report of the city engineer, Mr. Stephen E. Babcock, which was reviewed in the February number of Municipal Engineering.

Report of the Board of Park Commissioners of Wilmington, Del., for the year 1897. By Theodore A. Leisen, engineer and superintendent.

Annual Report of the Water Commissioners of the City of Binghamton, N. Y., for the year 1897. John Anderson, Secretary; Darwin Felton, Superintendent.

Twentieth Annual Report of the New Orleans Water Works company, for the year ending April 1, 1898. R. E. Craig, President; L. H. Gardiner, Superintendent.

Sixteenth Annual Report of the City Engineer of the City of Gloucester, Mass., for the year 1897. Winslow L. Webber, City Engineer.

Technical Meetings.

At a special meeting of the Engineering Society of Rochester, N. Y., April 2, a paper entitled "The Dimensions of the Hubs of Water Pipes," was read by E. Kuichling.

At a meeting of the Eugineers' Club, Brooklyn, N. Y., April 14, George W. Tillson, assistant engineer of the Department of Highways of Brooklyn, read a paper on "Street Paving," in which he gave a description of street paving in both America and Europe.

At a regular meeting of the American Society of Civil Engineers, April 16, George Hill, Assoc. M. Am. Soc. C. E., read a paper on "Steel Concrete Construction," in which the principal points referred to were the proportionate costs of corresponding steel and concrete floors, the use of structural steel as thin as No. 10 expanded metal, the possible injurious chemical action of cinder concrete on imbedded steel, the danger of calcining the limestone in concrete fireproofing when exposed to heat and water and the great uncertainty of the formulas which were wholly dependent on the experiments.

Personal.

R. H. Gamble has been appointed city engineer at Lima, O.

C. B. Gifford has been appointed city engineer at Berlin, N. H.

Edward C. Blake has been elected city engineer at Dubuque, Ia.

Louis Bernard has been elected street commissioner at Tiffin, O.

James U. Brown has been elected city engineer at Bloomsburg, Pa.

R. C. Gregory has been elected street commissioner at Carrollton, O.

H. Hoene has been elected street commissiner at New London, Wis.

H. L. Newman has been appointed water commissioner at Akron, O.

William Hart has been elected street commissioner at Birdsboro, Pa.

S. S. Stearns has been elected street commissioner at Cortland, N. Y.

George Bent has been elected street commissioner at Cripple Creek, Col.

E. P. Moses has been elected street commissioner at Coldwater, Mich.

W. H. Langdon has been elected street commissioner at Barabco, Wis.

Harry R. Virgin has been appointed water commissioner at Portland, Me.

John Gilbert has been elected street commissioner at Burlington, N. J.

M. R. Laird has been appointed assistant city engineer at Des Moines, Ia.

Thomas C. Wiley has been elected street commissioner at Lancaster, Pa.

Byron E. Alley has been elected street commissioner at Bay City, Mich.

John H. Martin has been appointed street commissioner at Bedford, N. Y.

W. L. Glovieux has been elected councilman-at-large at Irvington, N. J.

John R. Cotter has been appointed street commissioner at Essexville, Mich.

James Struble has been appointed street commissioner at Vicksburg, Mich.

Frank E. Taft has been elected superintendent of streets at Northbridge, Mass.

George Gardner has been elected superintendent of highways at Sea Isle City, N. J.

F. W. Perkins has been elected superintendent of public works at Newburg, N. Y.

R. D. Wilson has been appointed superintendent of public works at Lexington, Ky.

Charles Stevens has been elected superintendent of water works at Reedsburg, Wis.

M. A. Sinclair has been elected superintendent of the water board at Bangor, Me.

Theodore Steinacker, county surveyor, has been made city engineer at St. Joseph, Mo.

Nathanial S. Jackson has been elected commissioner of highways at Southampton, N. Y.

Morgan B. Blydenburg has been elected commissioner of highways at Smithtown, N. Y.

L. H. Parks has been elected president of the board of water works trustees at Toledo, O.

C. L. Penney wil succeed F. C. Norcross as superintendent of the water works at Lorain, O.

N. S. Beardslee has been elected chairman of the board of water commissioners at Warsaw, N. Y.

Peter Gulick and Roger Marshall have been elected surveyors of highways at Franklin, N. J.

William V. Ingham has been appointed city engineer and superintendent of sewers at Wilkesbarre, Pa.

George Cadmus and Seymour P. Gilbert have been elected surveyors of highways at Bloomfield, N. J.

Arthur J. Cox of the Iowa Engineering company has been reappointed city engineer at Iowa City, Ia.

Henry Stetson has ben elected mayor and George Lethridge president of the common council at Orange, N. J.

Joseph Meyerrose has been appointed superintendent of highways at Newton, borough of Queens, New York City.

G. C. Stoll, secretary of the Illinois Clay Workers' Association, has moved from Grant Park, Ill., to Wheaton, Ill.

William H. Browne has been appointed road engineer and Peter Black highway commissioner at Sea Cliff, N. Y.

Lawrence Dameron, Newport, Ky., has resigned his position as assistant city engineer. Bailey Mordidge will succeed him.

Chas. N. Myers has resigned as chief engineer of construction in the sewer department in the borough of Brooklyn, New York city.

George E. Carter has been elected superintendent of the water department, to succeed C. A. Bullens, resigned, at Chicopee, Mass.

Hugh E. Brady has been appointed chief of the sewer and assessment division of the street laying out department of Boston, Mass.

W. H. Barker, G. B. Healey and E. B. Spalding have been appointed trustees of the Sioux City Water Works at Sioux City, Ia.

C. B. Herod has been elected city engineer to take the place of John W. Fulwider, who was elected but declined to serve, at Lebanon, Ind.

Charles Beresford, Ralph V. Stager, Martin McGann and James McMahon have been elected highway commissioners at Belleville, N. J.

H. A. Jordan has been appointed a member of the board of water commissioners and Peter W. Fox street commissioner at Cossackie, N. Y.

Winfred H. Bennett, ex-city engineer of Manchester, N. H., has accepted a position with Charles A. Bailey, stone contractor, Suncook, N. H.

Gomer Thomas, state mine inspector of Utah, visited Ft. Duschene recently to investigate the method of working the asphaltum mines in that country.

John F. Cronin has been appointed superintendent of the sewerage system and the disposal plant at Far Rockaway, borough of Brooklyn, New York City.

Lafayette Higgins, who retired from his position of city engineer at Des Moines, Ia., April 18, has opened an office in that city and will practice civil engineering.

Lyman E. Cooley, late engineer commissioner of the Chicago main drainage channel and of the deep waterways commission, has been appointed advisory engineer to the commission which is now investigating the expenditure of the $9,000,000 appropriation for the New York state canals.

Peter Milne, M. Am. Soc. C. E., has resigned his position as assistant engineer of the borough of Brooklyn, in the department of water supply of New York City.

Charles A. Van Keuren, who has served as acting chief engineer of Jersey City, N. J., since the death of Lucien D. Fowler, has been unanimously elected chief engineer.

Theodore Hartman has been elected superintendent of public works; Martin Sharp, street commissioner, and J. O. Morrison, sewer commissioner, at Little Rock, Ark.

Dr. E. H. Maynard has been elected president of the board of water commissioners to succeed George Dickey at Nyack, N. Y. A. E. Christie has been appointed a commissioner.

Alfred T. White, ex-commissioner of public works at Brooklyn, N. Y., delivered an address before the Brooklyn League April 4 on the water system and the water supply of New York and Brooklyn.

William H. Fox has been elected president of the board of water commissioners at Penn Yan, N. Y. W. B. Shepard was elected secretary, George R. Cornwell treasurer and W. Stanley Bruen superintendent.

G. B. Healey has been elected president, John P. Allison secretary of the board of trustees for the city water works at Sioux City, Ia. E. B. Spalding was elected superintendent to succeed Phil Carlin.

Charles C. Brown, consulting engineer of Bloomington, Ill., delivered a lecture to the students in engineering in the University of Wisconsin at Madison on Friday, April 1, on the subject of "Engineering Ethics."

Ernest McCullough, consulting engineer to the Mayor and the Merchants' Association of San Francisco, has resigned the position he occupied and given up practice in that city. It is his intention to locate in some eastern city.

Alfred G. Beidrey has been appointed inspector of the sewerage system at Meriden, Conn., to succeed George Williams, resigned. John Dunn succeeds William Cross, who had charge of the disposal beds below South Meriden.

Chapman L. Johnson, ex-deputy state engineer, Albany, N. Y., has been appointed consulting engineer to T. Henry Dumary and the Wilson-Baillie Co., who have the contract for the installation of the filter plant in Albany.

Henry E. Gaylord has been appointed chairman of the board of water commissioners, Maurice J. Moriarity clerk and treasurer and Patrick J. Moriarity succeeds M. L. Barnes as superintendent at South Hadley, Mass.

F. A. Baldwin has been elected president and general manager of the Bowling Green Water company at Bowling Green, O. The other officers are A. E. Royce, treasurer; A. W. Rudoloh, secretary; J. H. Sampson, assistant secretary.

Hon. James M. Seymour has been re-elected mayor at Newark, N. J. Jasper M. Byrne was elected a member of the board of works and T. C. Hewson, Charles F. Herr, Peter Ulrich and Harrison Van Duyne were re-elected members of that body.

George F. Sigler and Frank N. Williams have been elected surveyors of highways and John H. Parkhurst, A. E. Williams, Geo. W. Morehouse, William R. Johnson and Bern W. Dickinson, members of the township committee at Livingston, N. J.

Henry Lohman has been elected water register at Hoboken, N. J.

James W. Wilding, paving contractor, died April 7 at Ft. Wayne, Ind.

J. Frank Hayes has been appointed superintendent of streets at West Springfield, Mass.

Walter L. Patterson has been elected superintendent of highways at Collingwood, Pa.

John T. Caine has been appointed superintendent of water works at Salt Lake City, Utah.

William F. Brown has been elected city engineer for a term of three years at Toledo, O.

Col. Robert G. Smith has been elected a member of the board of street and water commissioners at Jersey City, N. J.

Frank J. Smith has been re-elected superintendent of the Houston Water Works company, Houston, Tex.

A. Brooks Celiax has been re-elected city engineer of Hazleton, Pa., for a term of three years.

E. L. Shaw has resigned his position as city engineer at Green Bay, Wis., to accept a position at Steelton, Pa.

E. E. Rutledge, chief engineer of the Seivern & Knoxville Railroad company and the Carolina Midland Railroad company, Batesburg, S. C., is building sixteen miles of railroad from Seivern to Batesburg. The grading, bridging and trestles are completed and the track is now being laid.

Charles A. Ewing, C. E., St. Louis, Mo., has gone to San Jose, Costa Rica, Central America, where American contractors have a contract for building a railroad for the government from San Jose to the Pacific coast. John S. Casement of Painesville, O., is the chief contractor. Mr. Ewing will be gone for two years.

MACHINERY AND TRADE.

A Council Committee's Report on Street Cleaning Machines.

Alderman Fitchard, chairman of the committee appointed by the common council of Utica, N. Y., to investigate street cleaning systems, submitted a report on April 15th. The committee confined its investigation to mechanical systems of street cleaning, without considering manual systems excepting where the latter were combined with the former. The machines made by the Furnas Street Cleaning company of Indianapolis, and by the St. Louis Car company of St. Louis, were examined in full operation.

The Furnas pneumatic street cleaner was seen in operation at Cleveland and Indianapolis. The committee says: "The most objectionable features of this machine are its unsightly appearance and the smoke from the engine, but as an offset to these objections it possesses features strongly in its favor, namely, that it is practically noiseless in operation and that it cleans the streets absolutely clean, picking up the finest dust on asphalt and sandstone pavements. As the machine would be used at night only, the objections caused by smoke and its unsightly appearance would be reduced to a minimum."

The report explains that "a gutter machine precedes the pneumatic machine to sweep the dirt from the gutter into a winrow about four feet from the curb. The pneumatic machine follows as close to the curb as possible, picking up all the dirt swept from the gutter by the gutter machine, and cleaning a path about nine feet wide. All dirt picked up by the pneumatic machine is retained in a suitable receptacle located in the rear part of the machine until the volume is one and a half yards, and then is dumped upon the ground to be removed by wagons. One machine on a level, well-paved street can sweep an average of nine miles of thirty-foot streets in ten hours."

The sweeping machine manufactured by the St. Louis Car company was observed in operation at Cleveland in conjunction with the pneumatic machine. The committee says: "They present a neat appearance and seem to perform their work in a very satisfactory manner, although not to such a degree of fineness as the pneumatic machine. They are adapted to the removing of large quantities of dirt and leaving the street in a relatively clean condition. * * * The general condition of the street when cleaned by this system is not as sanitary as when cleaned by the pneumatic system. The pneumatic system should not be used unless supplemented by sweeping machines, on account of the need of cleaning streets during wet weather.

"The pneumatic machine manufactured in Indianapolis, Ind., cleans streets better than by any other system known to your committee; especially is this true on asphalt paved streets.

"We are of the opinion that all street cleaning machines are as yet in a crude state of perfection, and would not, therefore, recommend making a contract for a term to exceed from two to three years. If a contract is made for five or six years, the city will, in the opinion of your committee, be using street cleaning machines from two to three years behind the times. The im-

provement or perfection of machines for this work will be made within the next two or three years, and the city ought not to be tied up by long-time contracts, so as to be able to take advantage of the latest and most improved machinery to be had for street cleaning purposes." The report was accepted and filed and the committee continued.

Use of Motor Dust Vans in Street Cleaning.

T. W. E. Higgins, Assoc. M. Inst. C. E., surveyor to the vestry of the parish of Chelsea, England, in a recent issue of the London Contract Journal, gives some information regarding the proposed use of "motor dust vans," which, he says, by lessening the number of horses on the street, will decrease street dust and the wear of pavements, besides introducing economy in money and labor. Mr. Higgins says:

"In order to obtain the necessary estimates I wrote to eleven firms asking if they were prepared to submit estimates to the vestry for motor dust vans. The vans I specified were each to contain 6 cubic yards of refuse, which would not weigh more than four (long) tons; they were to be worked in accordance with the locomotives on highways act of 1896, and would be required to tip the refuse over a chute. From the replies I received it seemed evident that a vehicle of the size I specified is rather beyond the capacity of the ordinary electric motor or oil engine. There do not at present seem to be any firms making electrically-driven cars of the size we require. The makers of electric motor cars seem to be directing their attention more to light messenger vehicles than to heavy vans for business purposes."

The estimates submitted varied from $1,550 to $3,240. Mr. Higgins assumes that two horses and horse vans would be required to do the work of the motor van. He estimates horses at $340 each and vans at about $240, so that the capital required for the motor vans would be offset, he thinks, by the lower cost of operating the motor wagons, one less driver, though at a higher price, being required and there being no horses to feed and shoe.

The Asphaltum Deposits in Indian Territory.

The asphalt fields in Indian territory were visited recently by James A. Davis, industrial commissioner of the Santa Fe railroad. The fields begin at a point three miles from Dougherty and Davis stations, on the Santa Fe, and extend over an area fifteen miles in length and varying from three to five miles in width. The asphaltum is found in cliffs and ravines and sometimes in solid hills. It is in two formations, sometimes mixed with limestone and presenting the appearance of blue limestone, and side by side with this is found asphaltum with a mixture of fine sand. The quantity seems practically inexhaustible. There are three manufacturing plants in operation for the preparation of the refined product, which ship now three or four cars a day. Lack of transportation facilities has been a great drawback to the marketing of the output. The factories are planning to manufacture asphalt blocks. Analysis shows that a large deposit of manganese, which has been recently opened up, runs from 44 to 60 per cent. pure, while a little to the south are mountains of granite said to be equal to any granite found in Vermont, as well as quantities of oolitic limestone.

Purington Paving Brick.

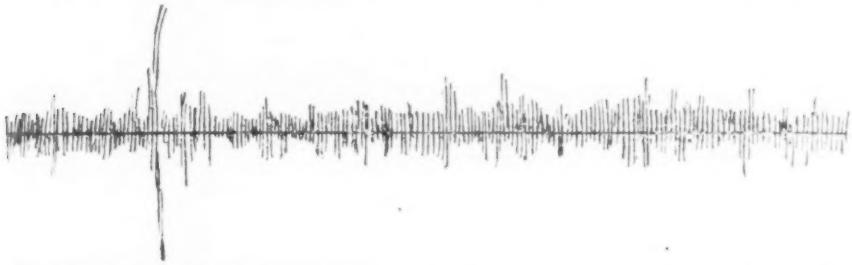
The Purington Paving Brick company has issued a small pamphlet briefly setting forth information regarding brick pavements. On the subject of foundations it advocates six inches of concrete for heavy traffic, but for all residence streets and moderate traffic recommends a two-course brick pavement, the bottom course laid flat on four inches of sand. The bottom course pavers are second grade which sell for $2 less per thousand than the No. 1 surface brick. The pavements of Winona, Minn., are of this kind, and it is claimed that after four years' wear they are still in good condition. A number of testimonial letters regarding advantages of brick for paving purposes and satisfactory experience with the material are set forth, including one from Street Commissioner Milner of St. Louis, stating that Purington paving brick had stood the best test of any tested in the St. Louis laboratory.

A Road Surface Indicator.

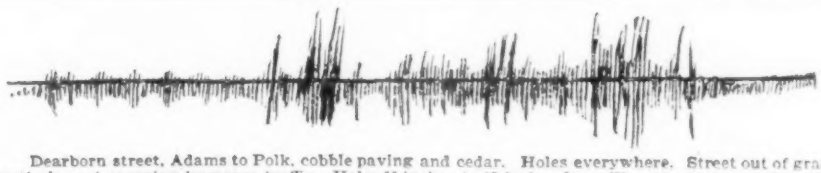
A Chicago man has invented a machine called "a road index," which records the undulations or unevenness of surface in pavements. The apparatus may be attached to a bicycle or any kind of vehicle. It will register to the sixteenth of an inch every variation in the evenness of the surface. It is claimed for it that it will show waves of asphalt, depressed manholes, elevations of bad street car crossings, etc., and is equally efficient in its performance of duty on asphalt, brick, granite, cedar block or macadam.

It may be operated at a speed of from four miles to twenty-five miles an hour. If necessary, it will give the surface condition of fifty miles of streets in one run. The registration is done upon a coil of paper, and mathematically is absolutely correct. Its work is to show just what kind of a street

surface vehicles and bicycles are compelled to pass over The record renders it impossible for any official or contractor to say that the surface of a street is true when it is uneven. If it is true the machine will register a straight line, and if untrue it will show every elevation and depression to the sixteenth of an inch. The first illustration of what this apparatus will do is in the cut showing the state of North Clark-st. before paving with asphalt, and the third cut shows its condition after the street had been paved with asphalt by the Barber Asphalt Paving company.



North Clark street, cedar, just before it was paved with asphalt. This section is from Kinzie to Superior.



Dearborn street, Adams to Polk, cobble paving and cedar. Holes everywhere. Street out of grade entirely, yet carrying immense traffic. Holes 11 inches to 15 inches deep. Elevations average 9 inches.

Two blocks of North Clark street, one day after paving with asphalt, showing a street in perfect condition at the time. The two blocks are from Superior north. The crosses at the end show the street grade.

The commissioner of public works of Chicago has already employed the inventor to take the record of a large number of streets in that city, and the machine promises to play an important part in the matter of the street problem. It puts on paper what, although known, cannot otherwise be proven or demonstrated to others.

Record of the Barber Asphalt Co.

The annual book of the Barber Asphalt Paving Company has just been issued for 1898. An attractive design in colors, seductively combining feminine beauty with the winning features of the asphalt pavement business as conducted by the Barber Company, is shown on the cover, and assures a lingering interest in all that follows, with more or less frequent recourse to the cover. The 126 pages in the book by the city engineer of the cost of paving are filled with facts and figures pertaining to Trinidad lake asphalt pavements, as laid by the Barber company, supplemented with many illustrations and maps showing streets paved by the Barber company in Boston, Buffalo, Chicago, Jersey City, Kansas City, Louisville, Newark, New Orleans, New York, Omaha, St. Louis and Washington. In an introductory article the history of asphalt paving in the United States is briefly reviewed and the statement is made that since the first pavement was laid in Washington, twenty-two years ago, it has spread to over 100 cities and to an extent of about 24,000,000 square yards, which, on a street 26 feet wide, would be about 1,500 miles in length. The article says: "The construction of asphalt pavements is peculiarly an industry requiring technical skill and experience, and the test of success is its use during a term of years. City authorities, in the exercise of their discretion in drawing specifications, can follow no better guide than the result of years of actual use, and they can only avoid the risk of failure and the expense of experiment by adopting materials which have stood the test of from ten to twenty years of constant use and by awarding contracts to responsible and experienced companies which have never defaulted in their obligations." The Barber

company has laid pavements in fifty-five cities, as shown by the list. The total extent of their work is 10,606,530 square yards, equivalent to about 710 miles of roadway 26 feet wide. The pamphlet contains many testimonial letters from city officials and others regarding the high character of the work done by the Barber company.

Asphalt Pavements Laid by the Warren-Scharf Company.

The Warren-Scharf Asphalt Paving company has issued a new pamphlet on Trinidad lake asphalt pavements, describing the methods of laying and the advantages of such pavements, with many fine illustrations, giving views of streets paved with asphalt in different cities, together with maps showing the streets paved by the Warren-Scharf company in Cincinnati, Columbus, Dayton, Detroit, Indianapolis, New York, Rochester, St. Paul, Toledo, Toronto and Utica. A list of streets paved by the company is also given, showing the year in which the work was done, the number of square yards and the total cost. A summary of this list, which, in detail, fills seventeen pages, shows that the Warren-Scharf company has laid pavements in thirty-seven different cities, amounting to 4,239,738 square yards.

Paving Brick Tests in Detroit.

The board of public works, Detroit, Mich., is conducting a paving brick test in which the standard in the rattling test is 15 per cent. loss.

A table of the whole test made up to April 20, showing the average of each sample and the general average, is as follows:

	Brick against brick.	Scrap iron test.	Average.
1. Harris	11.60	5.63	8.61
2. B. B. Granite	8.68	8.75	8.71
3. Star	9.66	8.28	8.97
4. Buckeye	9.26	9.44	9.35
5. Athens	9.50	10.26	9.88
6. Townsend	8.38	14.35	11.36
7. Metropolitan	12.80	10.01	11.40
8. Union Paver	13.53	12.97	13.25
9. Nelsonville	13.90	13.64	13.77
10. Masillon	14.37	15.85	15.11
11. Logan	13.12	19.54	16.33
12. Malvern	18.62	15.96	17.29
13. Spilman	28.84	20.51	24.67

Recent Inventions.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

601,598.—March 29, 1898.—Street Sweeper. I E. Stump, Canton, O. In this device there is the usual rotating brush which discharges the sweepings upon the lower part of an endless elevator. Mounted above the brush is a blast fan which discharges at the rear of the brush, thus blowing the sweepings forward.

601,794.—April 5, 1898.—Catch Basin for Sewers. J. W. Hershberger, Plymouth, Pa. A drain for a specific and limited construction in which the inlet is lower than the outlet

602,244.—April 12, 1898.—Water Tower. H. C. Schmidt, New York, N. Y. In this device there is, besides the main standard supporting the pipe, a tower brace of peculiar construction, pivotally mounted upon the base frame and provided with means by which it may be swung up into or down out of operative position.

602,309.—April 12, 1898.—Excavating Machine. A. Cryer and E. C. Newby, Cardiff, England. The power plant and crane are mounted upon a platform which is supported, on a suitable truck, on a vertical pivot. The crane carries a boom which carries a chain of scoops or buckets and also a series of picks.

A New Tamping Machine for Use in Laying Asphalt Pavement.

An ingenious and effective labor saving device is that invented by Adam Mauger, recently removed from Kansas City to St. Louis, and now being used by the Gilson Paving company on Euclid-ave., just north of Fifteenth. The machine is a combination roller and tamper, and with one man to guide and govern it, it does the work of eighteen men on the upper covering of the asphalt pavement.

The machine consists of a roller very like the heavy roller ordinarily employed in that work, and the tamping apparatus, which is something of a novelty. By means of this machine, its operators claim, the work is uniform in every part and the labor of eighten men is saved.

On what might be called the front end of the roller, which runs both ways, and attached to it, is the tamping machinery. There are five tampers in a row along the front, which, with the long iron handles, weigh about twenty pounds each. The bottom, or part that strikes the pavement, of the five are of iron one inch thick and the three inner tampers in the row are triangular. The point of the middle one fits between the two bases of the adjoining ones, and these are likewise dovetailed into the two outermost. They strike alternately and are raised eighteen inches before the next fall happens with uniform 260 pounds force.

The motor part of the engine is connected

by a cog chain that starts the up and down movement of the tampers. The handles are six feet long and extend straight up. At the top of each is a dog, which releases the tamper and allows it to fall until the shoe strikes the pavement. A coil spring, which is forced down by the fall of the tamper, causes it to immediately rebound when it strikes the pavement, thus offering no impediment to the forward motion of the machine. The difficulty which has confronted inventors has been that of preventing the dragging of the tampers. This difficulty appears to have been effectually overcome by means of the coil spring.

The speed attained is twenty-four feet a minute, and two-thirds of the space hit by one stroke is hit again on the next blow. The result is a smoother surface and a more uniform density than the hand tamping produces. The machine is for use only on the top coat of asphalt and follows a preliminary hand tamping and is in turn followed by the roller in the final pressing.

A machine is in the course of construction by which the shoes of the tampers will be heated, a gasoline burner being located in each shoe for this purpose. This will do away with the fire box now employed with its attendant smoke and ashes.—Kansas City Times.

Trade Notes.

The Indiana Clay company, Shoals, Ind., has been incorporated.

A large stone crushing plant will be established on Hook mountain at Nyack, N. Y.

A railway asphalt plant is being built for Frank E. Cole of Toledo by Hetherington & Berner.

The Mussey Stone company's quarry has been sold to the Cleveland Stone company, Cleveland, O.

Street sweepers are being given a trial in Omaha, Neb. The city contemplates the purchase of one or more.

The plant of the Wayland Cement company, Wayland, N. Y., will, according to press reports, be enlarged.

The erection of a stone crusher is contemplated at Eudora, Kas., on lands now owned by Charles Lothholz.

Fred Cumeric contemplates establishing a plant for the manufacture of paving and building brick at Danville, Ill.

The purchase of an asphalt repair plant is contemplated by the board of street commissioners at Binghamton, N. Y.

Clay, suitable for manufacturing vitrified brick and sewer pipe, has been found by F. R. Carter, who has a plant in Chilton, Wis.

The Southwestern Alcatraz Asphalt and Construction company, Cincinnati, O., has been incorporated with a capital stock of $200,000.

The Illinois Portland Cement Paving company, Chicago, Ill., has been incorporated by A. F. Melter, E. T. Martin and H. L. Hanley.

Hetherington & Berner are building a stationary asphalt plant, with latest improvements, for the R. F. Conway company of Chicago.

The Golden Cement company, Jeffersonville, Ind., has been incorporated by J. J. Lewis, Daniel Weber, W. E. Henderson and H. B. Pyne.

The West Side Crushed Stone company, New York City, has been incorporated by Lawrence J. Rock, James C. Mack and J. D. Campbell.

Excavations have begun for the new cement plant which will be erected at Cementville, Ind., by Charles Goetz and others of St. Louis.

W. P. Mumaugh, agent at Omaha, Neb., for the J. B. Smith Paving company of Chicago, has been made manager of the Iowa Brick company.

The Globe cement company, Jeffersonville, Ind., is erecting additional kilns and will increase the capacity of its mills to 700 barrels per day.

The Kansas City Paving Brick and Tile company of Kansas City, Mo., has been incorporated by J. R. Lillis, J. G. Glennon, James Burns and W. H. Lucus.

E. M. Bailey has been appointed receiver of the Royal Fire Clay Works, at Uhrichsville, O., to succeed Receivers T. J. Evans and J. M. Cooper, who resigned.

The asphaltum bed under the Confederate Home, Higginsville, Mo., is said to have been leased to a St. Louis firm for 52½ cents per ton for all the crude rock mined.

The Central Sewer Pipe company of Pittsburg, Pa., has moved its offices from Pittsburg to Steubenville, and will endeavor to incorporate the Ohio sewer pipe firms.

The Fairview Stone Crushing company has been incorporated by John J. Duff of New York City; Isaac M. Van Wagner, Nyack, N. Y.; John W. Heck, Jersey City, N. Y.

William H. Turrell has resigned his positions as president of the Standard Paving company, Newark, N. J., but will continue in the artificial stone and asphalt business.

The Berkshire Cement Mills company, who are building a fine plant at Stamford, Conn., have placed an order with the Bradley Pulverizer company of Boston for a full supply of their pulverizers.

The Maryland Cement company, located at Sparrows Point, has an order from the government for 10,000 barrels of cement to be used in the construction of the concrete fortifications at North Point.

The purchase of the Pedernales asphalt mine by Governor Pingree of Michigan is reported. The mines are situated on the Pedernales island, Venezuela, near the mouth of the Orinoco river.

The plant of the Sioux City Sewer Pipe company, Sioux City, Ia., was sold, at public auction, to S. R. Clark of Peoria, Ill., April 14, for $8,500. The plant will be placed in operation at once and particular attention will be given to the manufacture of paving brick.

The water filtration companies of the United States have united and will establish a plant in Philadelphia, operating under the name of the New York Filter Manufacturing company. The officers of the company are: President, W. G. Warden, Jr., Philadelphia; general manager, S. L. Morrison; assistant general manager, W. B. Nye; treasurer, John Denison; secretary, John C. Symonds.

G. M. Connor of Detroit, Jackson Schuman of Bronson and Messrs. Hoch Flint and Meyerhaber of Adrain contemplate the erection of a Portland cement plant at Coldwater, Mich., at an expenditure of $150,000.

The Bonneville Cement company, 261 Broadway, New York city, whose works were burned recently, has placed an order for five new Griffin mills for its new plant with the Bradley Pulverizer company of Boston.

The Illinois Steel company has decided to use Bradley pulverizers exclusively in the very large works they are erecting for manufacturing clay cement. The Bradley Pulverizer company will ship four machines at once to them.

The Kentucky Fire Brick Works, Portsmouth, O., wishes to buy about fifteen tons of twenty T rails, second-hand, with splice bars, and about fifteen dump cars, bottom dump preferred, capacity about 3,000 to 5,000 pounds; must have good brakes.

The American Paving and Contracting company filed articles of incorporation at Cheyenne, Wyo., April 19. The incorporators are Richard W. Wilde, A. McClurg, Noah Canfield and J. Warren Mills. The company will have offices in Cheyenne and Denver.

The Nazareth Portland Cement company has been organized at Allentown, Pa., with the following officers and directors: President, Dr. James P. Barnes; vice-president and general manager, Dr. Irving N. Bachman; secretary and treasurer, Edgar I. Belden. Directors: Charles D. Cramp, Philadelphia; E. H. Jones, Wilkesbarre; James P. Barnes, Allentown; Irving Bachman, Allentown; Edgar I. Belden, Stamford, Conn. The erection of a plant at Nazareth will begin at once.

The Howe's Cave Cement Co., a consolidation of the Howe's Cave Lime and Cement company and the former Howe's Cave Association, has been organized to manufacture Portland cement from clay and limestone deposits in the vicinity of Howe's cave. The officers of the company are: President, T. Henry Dumary, Albany, N. Y.; vice-president and general manager, Charles E. Lee, Binghampton; secretary and treasurer, Charles H. Ramsey, Howe's Cave; superintendent, Sheldon Norton, Hokendauqua, Pa.

The Iroquois Iron Works has purchased and enlarged the plant and equipment of the Barber Asphalt Paving company's Buffalo shops. The organization and equipment is now complete for all kinds of machine, forge, boiler and sheet steel work. Mr. King, the manager, writes: "We have also acquired the Barber company's drawings and patterns for the manufacture of machinery, in which they have had long experience, and will at all times carry in stock a complete line of asphalt machinery and tools ready for immediate shipment. Special attention will be given to the design and manufacture of high-grade steam rollers from two to thirteen tons weight."

SELECTIONS FROM THE PRESS.

How to Make a City Prosperous.

That the present is an age of progress is beyond denial, and nowhere is it more noticeable than in the line of municipal improvement. The city that has good government, that keeps abreast of the times in all that conduces to the cleanliness, health and morality of its pople is the one that you will find progressing even though there be rumors of war and an era of financial depression.

Epidemics of disease may not be entirely eliminated, but they may be reduced to a minimum by sanitary measures, by pure water, by a systematic clean-up of the streets and alleys, and an endeavor to prevent a herding of the people in tenements, into the rooms of which sunshine is never permitted to enter, and in which people are crowded until it is a wonder that they live at all.

There is no question but that the open sewers of southern cities have been largely responsible for the yellow fever epidemics, and impure water for typhoid fever in many cities of the North. It may be that these evils are difficult to overcome in some cases, but with the bright minds in the sanitary engineering world the problem may be solved, and the evils corrected.

Last year the mayor of Kansas City took the matter of cleaning up the city in hand, and resulted in one of the biggest advertisements Kansas City ever had. It was a new thing, but it was a great success. Other cities took the idea up, and Kansas City was given the credit for originating it. It was a popular thing. People responded with a will, and Kansas City was given a renovating such as no city had ever had. This year the general cleaning of the city, improvement of the sanitary conditions, cutting of weeds, building of parks and boulevards, systematic paving of down town streets and alleys—these are some of the many progressive measures that will be pushed to even better results than during the past two years.

In the city of New York the street-cleaning brigade and the utilization of the refuse has been brought to a high degree of perfection. The garbage is thoroughly sorted and all that is of any value is sold and brings to the city no inconsiderable revenue.

The questions of street cleaning and the disposal of the refuse are ones that have attracted widespread attention in the leading cities of this country and Europe, and various are the methods adopted.

Clean streets, a good system of sewerage,

pure water and an administration of public affairs on the lines of approved economic methods and reforms in the interest of the people, will always place a city in the front rank, and will enhance the value of its real estate, as it commands the confidence of investors.—The American Land and Title Register.

The Strength of Sewer Pipe.

Some experiments recently made by Mr. Frank A. Barbour of the Boston Society of Civil Engineers, and published in the Journal of the Association of Engineering Societies, enable us to acquire some idea of the strength of sewer pipe and the pressures to which it is subjected in the ordinary course of usage.

The experiments were made so as to conform as closely as possible to actual practice, the pipe being laid in a trench in the usual manner, after which pressure was applied by a hydraulic machine to a platform resting on a filling over the pipe. In the tests of earth pressure the same machine was placed in the bottom of a deep trench, and the earth filled upon a platform resting on the plunger, which communicated the pressure to a gauge.

The tests were made upon sizes ranging from 6 to 24 inches in diameter, and with both the standard and double-strength pipe of soft, medium and hard burned grades, as indicated by the manufacturers.

Mr. Barbour has sought to express the relation of the dimensions of pipe to its breaking strength by a formula which follows with reasonable closeness the curves deduced from his tests; but for all practical purposes it suffices to know that the breaking load per lineal foot averaged about 2,800 pounds for the standard pipe and 4,000 of that of double strength.

The trench experiments were made with filling of various materials, loam, sand, gravel and clay being used, and the pressure transmitted to the bottom of the trench varied from 30 to 60 per cent. of the weight, according to the filling.

In general, the actual pressure at different depths was ascertained, and expressed as a percentage of the weight of earth superimposed. This value, in the case of loam and gravel, was found to be equal to the difference between unity and the coefficient of friction of these materials, and, if this relation extends to other materials, a means is afforded of estimating the actual earth pressures in trenches of all materials of which the coefficients of friction, or angles of repose, are known.—Engineering Magazine.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Norwich, N. Y.—Aldermen Adrian Babcock, H. J. Daniels, H. L. Short, George Wheeler and Henry Hewitt visited Syracuse, Rochester and other cities recently to inspect asphalt and brick pavements.

Salt Lake City, Utah.—The Pacific Paving company was given a judgment against the city for a total of $27,077.12 on account of money retained for paving done in 1891, together with interest accrued since that time.

Denver, Col.—Judge Riner of the United States District court, Cheyenne, Wyo., granted a permanent injunction, April 18, restraining the Denver Paving company from proceeding with the work of paving the Broadway district. The contract was awarded Dec. 16, 1897, and involves an expense of $77,133.41.

Denver, Col.—A writ of mandamus was issued in the United States court, April 11, compelling the city to pay $19,000 to the Barber Asphalt Paving company for paving between the tramway tracks on certain streets. The case has been pending in the federal court for several years. An appeal will probably be made to the United States Court of Appeals.

New York City.—The guarantees on the greater part of the asphalt streets laid in the borough of Manhattan during the last two years expire in September, when the city will be obliged to keep them in repair. The passage of a wide-tire ordinance before that time, as a future preservation of the asphalt streets, is urged.

Chattanooga, Tenn.—Argument in a suit brought by the Southern Paving company against this city was heard in the Chancery Court, April 18, and taken under advisement. The suit grows out of the paving of Whiteside-st. and is for the purpose of recovering $5,000 which the city held as a guarantee that the pavement would wear for five years and which the city claims it did not.

Boston, Mass.—The securing of a contract for 5,000 square yards of asphalt in Houston, Tex., by the Barber Asphalt Paving company has resulted in Richard Dana, superintendent in this city, being transferred to Houston. The supervision of the company's business has been placed, during Mr. Dana's absence, in the hands of G. P. Griffith, jr., with headquarters in Scranton, Pa. H. R. Kasson, the western manager, who has been located in Kansas City, Mo., has gone to Chicago, where his future headquarters will be.

Kansa City, Mo.—At a meeting held April 13 the city counselor, city engineer and public improvements committees of the council decided that all sidewalk contracts

must be awarded by the city engineer, and citizens cannot, hereafter, lay their own walks or let the work to private contractors.

CONTEMPLATED WORK.

Clinton, Mass.—Main-st. will be macadamized.

Bloomington, Ill.—Brick paving is contemplated for certain streets.

Little Falls, N. Y.—Mill-st. will be paved with brick.

Morgantown, W. Va.—The question of brick paving is being discussed.

Patton, Ill.—A petition is being circulated for paving Magee-ave. with brick.

Atchison, Kas.—A petition is being circulated to pave Third-st.

New Brunswick, N. J.—Estimates will be secured for paving Spring-st.

Nanticoke, Pa.—Brick paving is contemplated for Main-st. B. F. Griffith, cy. clk.

Newport, R. I.—The macadamizing of Bliss road has been recommended by the street committee.

Ottumwa, Ia. — The city council has ordered that W. Second-st. be paved with brick. Mayor Phillips.

Rome, N. Y.—Estimates will be prepared James and Dominick-sts.

Middletown, O.—An ordinance to curb and gutter a portion of First-st. has passed. C. B. Johnson, prest. coun.

Cortland, N. Y.—The question of paving Main-st. is still being considered. Chrmn. Wallace of paving com.

Paterson, N. J.—The board of aldermen has passed resolutions to grade and curb portions of twelve streets.

Winsted, Conn.—N. Main-st. will be macadamized, the sum of $3,000 having been appropriated for that purpose.

Sandusky, O.—Resolutions for paving seven streets with brick have been introduced in the council.

Marshalltown, Ia.—The council has decided to pave thirty-three blocks with brick.

Franksville, Wis.—The construction of a stone road about seven miles long has been decided upon by the farmers.

Aurora, Ill.—The question of paving Downing Place with asphalt is being considered by the city council.

Oneida, N. Y.—Vitrified brick was decided upon April 15 as the material for paving Madison-st.

St. Paul, Minn.—Cycle paths will be constructed in Westminster-st. and Cleveland and Summit-aves.

Victoria, B. C.—Wooden block paving and new sidewalks are contemplated for portions of Fort and Board-sts.

Lee, Mass.—An appropriation of $10,000 has been voted to macadamize Main-st. Chas. H. Pease, clk.

New Orleans, La.—An ordinance has been passed by council to pave Rampart-st., from Keleric to Esplanade, with asphalt.

Allegheny, Pa.—Bids will be asked soon for both block and sheet asphalt paving on East-st. G. C. Langenheim, cy. engr.

Salamanca, N. Y.—A petition is being circulated for constructing about 3,500 feet of brick paving. E. B. Senear, vil. clk.

New Haven, Conn.—Mayor Farnsworth advocates vitrified brick paving for Chapel-st., between State and York.

Albert Lea, Minn.—The question of asphalt and brick paving promises soon to become an interesting issue.

Macon, Ga.—A resolution was passed by council April 19 to pave Cherry-st., from Second to Fourth, with brick.

Minneapolis, Minn.—Resolutions have been passed by the city council to pave numerous streets with brick and asphalt.

Patchogue, R. I.—Plans for paving Main-st. with brick are being considered by the village trustees, Jere C. Mills, trus.

Freeport, Ill.—An ordinance has been passed by the town council, providing for the paving of Fifth-st., from the railroad to High-st.

Mansfield, O.—Resolutions have been passed to pave, macadamize, etc., E. Bloom, Newman, Flint and Orange-sts. D. S. Koontz, prest. coun.

Bay City, Mich.—The council has ordered Center-st., from Water to Madison, 12,000 square yards, paved with brick. Geo. Turner, cy. engr.

Logansport, Ind.—A petition is said to be in circulation asking that Broadway, from Seventh-st., east, be paved with asphalt.

Franklin, Pa.—About 2,500 square yards of vitrified brick paving will, according to report, be laid in June. Thos. L. Kennerdell, cy. engr.

Cranston, R. I.—The question of paving Orchard-ave., from Park-ave. to Lorin-st. is being considered by the town council.

Toronto, Ont.—Petitions have been signed for an asphalt pavement in Euclid-ave., from College to Ulster-st. Cy. Clk. Blevins.

Portland, Ore.—A petition is being circulated asking that Davis-st., from Third to Twelfth, be paved with brick on a 6-inch concrete foundation.

Cambridge, O.—An ordinance has been passed for paving Wheeling-ave., from Twelfth to Fourth-st., with Hallwood blocks.

Decorah, Ia.—The question of street paving is being considered. Aldermen H. H. Adams and L. L. Couse have been appointed a committee to investigate.

Plainfield, N. J.—Asphalt, vitrified brick or some other permanent paving material is being urged for the streets in the business center of this city.

Sheboygan, Wis.—The board of public works has received instructions from the council to proceed with paving Pennsylvania-ave., from Fourth to Eighth-ave.

Reading, Pa.—The list of streets to be paved reported by the highway committee includes about forty blocks of asphalt and twelve blocks of brick paving.

Joplin, Mo.—The alleys between Pearl-st. and Byers-ave. and between Wall and Pearl-sts., will be graded and macadamized. T. W. Cunningham, mayor.

Kansas City, Mo.—Ordinances were approved, April 18, for paving portions of Charlotte, College, Eighteenth, Gillis, Madison, Prospect and Jay-sts.

Grand Rapids, Mich.—The common council has requested the board of public works to furnish an estimate of the cost of paving Jefferson-ave. with asphalt.

Ypsilanti, Mich.—The council is considering the question of paving Congress-st. Cedar blocks on concrete is said to be favored by the property-owners.

Ravenna, O.—Resolutions have been passed to construct stone sidewalks in N. Prospect, N. Walnut, Meridian, Spruce and W. Bowery-sts. A. S. Cole, mayor.

Binghamton, N. Y.—(Special.)—H. Ward says that specifications for a brick pavement on concrete foundation have been ordered for Court-st., from Carroll to Liberty.

Easton, Pa.—The petition for the improvement of the Delaware river road, from Easton to Martin's creek, has been approved by the grand jury. J. Marshall Young, eng.

St. Paul, Minn.—The board of public works has decided to recommend to the common council that a 7-foot boulevard be constructed on Burr-st., between Collins and Minnehaha-sts.

Denver, Col.—The park commissioners have decided to appropriate $500 for the purpose of experimenting with disintegrated granite pavement at the various entrances to City Park.

Newark, N. J.—Ordinances have been passed for paving Howard-st. and Hillside-ave. with sheet asphalt, and Norfolk and Lock-sts. with oblong granite blocks. Wm. E. Greathead, clk.

Salem, Mass.—The committee on streets and Street Commissioner Cook are considering the question of paving some short street with asphalt and if it is a success to continue laying it yearly.

Richmond, Va.—Appropriations for paving have been made by the board of aldermen as follows: Broad-st., asphalt blocks, $7,400; Fourteenth-st., granite spalls, $3,226.36.

Chicago, Ill.—It is probable that the granitoid block paving on Michigan-ave., from Jackson-st. to the river, and Rush-st., from the bridge to the river, will be resurfaced with asphalt.

Utica, N. Y.—A petition has been presented to council asking for asphalt paving in Leah-st. The material to be used in paving portions of Post-ave. and Broad-st. will be decided upon May 6.

Milwaukee, Wis.—The board of public works has recommended to the common council that all of that portion of Grand-ave. which is now paved with cedar block be repaved with brick and asphalt.

Rochester, N. Y.—The property-owners on Spencer-st. have petitioned for a new pavement, but do not specify any particular material, leaving the selection of it to the council and city engineer.

Springfield, Mass.—Petitions have been submitted to the board of supervisors asking that Walnut-st., between State and King, be paved with asphalt or vitrified brick, and that Sargeant-st. be macadamized.

Kalamazoo, Mich.—Petitions are being circulated asking that the city council submit to vote the question of issuing $210,000 bonds for public improvements, paving, sewers and extension of water mains.

Rockford, Ill.—A petition is being circulated for single-course brick paving in Cherry-st., from Simmons to Berrien-st. Asphalt paving is proposed for S. Main-st., from the Illinois Central tracks to Morgan-st.

Milwaukee, Wis.—A committee, consisting of H. Schwarzburg, A. C. Zinn, Herman Hirsch, John Bechtel and F. Kraus, has been appointed to circulate a petition to repave Chestnut-st., from Third to Seventh, with brick on concrete.

Camden, N. J.—The city council passed, under a suspension of the rules, April 7, new ordinances for the repaving of Cooper, Federal and Market-sts. and Broadway, Haddon and Kaigh-aves. with asphalt. Cooper B. Hatch, mayor.

La Salle, Ill.—(Special.)—C. M. Rickard says the construction of about 50,000 square yards of brick paving and about 22,000 lineal feet of stone curbing is contemplated for the near future. The contract has not yet been awarded.

Syracuse, N. Y.—The highway committee has reported favorably on petitions for paving College Place, from University Place to Euclid-ave., with asphalt or asphaltina, and White-st., from South-ave. to Rich-st., with asphalt, asphaltina or brick.

Oskaloosa, Ia.—A resolution was passed, April 18, ordering the construction of two-course brick paving on portions of Seventh, D and North C-sts. and College-ave. and single course paving for Ninth-st. and curbing for Fourth-ave., from First to Seventh-st.

London, Ont.—The board of works agreed, April 13, to recommend to the council that Dundas-st., from Wellington to Waterloo, be paved with asphalt, and that an artificial stone sidewalk be constructed on the north side of Dundas-st., from William to Colborne.

Boston, Mass.—Estimates for street improvements have been submitted by Benj. W. Wells, supt. sts., as follows: Blue Hill-ave., granite blocks, $50,900; Harrison-ave., granite blocks, $13,700; Webber-st., macadam, $3,900; Hunneman-st., $10,700; Fellows-st., $9,800.

Baltimore, Md.—An ordinance has been passed to pave, with Belgian block, and curb, Maryland-ave., from Twenty-fifth to Twenty-ninth-st. The committee on highways decided, April 14, to report favorably on the ordinance to pave the streets around Collington square.

Sedalia, Mo.—A resolution has been passed to pave Grand-ave., from Main to Broad, with American bituminous rock asphalt. An ordinance has been passed providing for the condemnation of wooden and defective sidewalks in a number of streets and the construction of brick, stone or concrete walks to replace them. P. D. Hastain, mayor; W. O. B. Dixon, cy. clk.

Indianapolis, Ind.—Final action was taken, April 27, on the proposed construction of cement walks on Alabama-st., between Mass.-ave. and St. Clair-st.; Alabama-st., between Eleventh and Sixteenth; College-ave., between Fourteenth and Fifteenth. A petition was received asking for asphalt paving, with cement walks, in State-st., from Washington to Michigan.

Dunkirk, N. Y.—The streets committee recommended, April 19, the purchase of a large quantity of asphaltic cement from the Barber Asphalt Paving company, Buffalo, to be used as an experiment in repairing brick pavements; also, the purchase of 10 or 15 car loads of crushed stone to be used as a top dressing on macadam pavements.

CONTRACTS TO BE LET.

Corpus Christi, Tex.—Sealed bids will be received until May 8 for grading. W. B. Hopkins, co. judge.

Alliance, O.—Bids are asked until May 7 for asphalt block paving in Main-st. J. H. McConnell, cy. clk.

North Haven, Conn.—Bids are asked until May 2 for the construction of a pavement. Henry B. Todd, first selectman.

Stamford, Conn.—Bids are asked until May 7 for improving a section of roadway from Darien to this town. Edwin S. Holly, first selectman.

Huntington, W. Va.—Bids are asked until May 9 for constructing a road. F. L. Doolittle, clk. co. court.

Rockville, Ind.—Sealed bids will be received until May 16 for the construction of gravel roads in Greene township. Isaac Lloyd, mem. co. comrs.

Lafayette, Ind.—Bids will be received until May 9 for one mile of curbing and cement sidewalks on Main-st. W. K. Eldridge, cy. engr.

Rockford, Ill.—Sealed proposals will be received until May 2 for paving E. State-st. with asphalt and brick. Edwin Main, cy. engr.

Washington, Ind.—Bids will be received until May 4 for paving eight streets with vitrified brick. Daniel S. Monagan, Jr., cy. clk.

Hornellsville, N. Y.—Sealed proposals will be received until May 9 for about 6,000 square yards of brick paving. F. W. Dalrymple, cy. engr.

Greensburg, Ind.—Bids will be received until May 6 for constructing pikes in Sandcreek twp. Coleman T. Pleak, co. audt.

Cleveland, O.—Sealed proposals will be received until May 14 for asphalt paving in eleven streets. Geo. R. Warden, dir. pub. wks.

Erie, Pa.—Bids are asked until May 14 for repairing stone pavements and laying crosswalks, curbing, etc. Benj. E. Briggs, cy. engr.

New Orleans, La.—Sealed proposals will be received until May 10 for furnishing about 3,000 tons of brick. Geo. McC. Derby, capt. engrs.

Bozeman, Mont.—Bids are asked until June 8 for constructing a road on the Middle Fork of Sixteen-Mile creek. H. P. McNaughton, co. clk.

Uniontown, Pa.—Bids are asked until May 2 for furnishing about 600,000 vitrified paving brick. Cooper & Swearington, boro solicitors.

Walker, Minn.—Bids will be received until May 2 for grading and improving Cleveland boulevard, from Fourth to Sixth-st. M. J. Quam, vil. rec.

Maysville, Ky.—Sealed bids will be received until May 7 for the repairs of the turnpikes of Mason county. John E. Wells, secy. turnpike comrs.

Scottsburg, Ind.—Sealed bids will be received until May 6 for constructing gravel, slate and macadam roads. Jas. L. Fisher, co. audt.

Mt. Clemens, Mich.—(Special.)—Sealed proposals will be received until May 2, for repaving with brick or concrete certain streets. Henry C. Benton, cy. clk.

Cameron, W. Va.—Sealed bids will be received until May 5 for street grading, curbing and paving. Plans and specifications open for inspection at office of mayor.

Troy, N. Y.—Bids are asked until May 3 for paving Maple-ave. with brick and for repairing the asphalt paving on two streets. E. Ogden Ross, secy. cont. bd.

Wabash, Ind.—Sealed proposals will be received until May 9 for macadamizing the roadway and paving the sidewalks in Walnut-st., from Washington to Hill. Howe McGuire, cy. clk.

Clinton, Mass.—Bids are asked until May 4 for constructing a road at the Wachusett reservoir in Clinton and Boylston. Henry H. Sprague, chrmn. Met. Water Bd., Boston, Mass.

Tampa, Fla.—Sealed proposals will be received until May 5 for 47,000 superficial yards and 22,000 lineal feet of granite paving and for paving and curbing certain streets. Sealed proposals will also be received May 2 for paving certain streets with pebble phosphate. W. B. Henderson, prest. B. P. W.

Geneva, N. Y.—Sealed proposals will be received until May 2 for about 50,000 square yards of vitrified brick, asphalt or other asphaltic paving. Edward Seybolt, supt. B. P. W.

Cedar Rapids, Ia.—Sealed bids will be received until May 6 for building and repairing sidewalks, crossings, drains, culverts and plank repairs on bridges for one year. J. Blair, cy. rec.

Buffalo, N. Y.—Sealed proposals will be received until May 5 for grading sidewalks and paving for a state armory building at Buffalo. Chas. Whitney Tillinghast, adj.-genl.

Buffalo, N. Y.—Sealed proposals will be received until May 5 for paving portions of Portage, Sycamore, N. Parade and Northampton-sts. with asphalt, brick or other materials. R. G. Parsons, secy. B. P. W.

Monticello, Ind.—Sealed proposals will be received until May 7 for improving ten streets by paving with macadam, with brick crossings. Bids will be received until May 14 for improving Main-st. Web. P. Bushnell, engr.

Newark, N. J.—Sealed proposals will be received until May 5 for paving and repaving with asphalt Humboldt-st., 1,900 square yards; Lincoln-st., 1,500 square yards; Murray-st., 4,400 square yards; Court-st., 2,100 square yards; Third-st., 6,000 square yards. J. C. Mundy, genl. supt. wks.

Cincinnati, O.—Sealed proposals will be received until May 5 for macadamizing Francisco-st., from Fulton-ave. to St. James-ave. A. P. Butterfield, clk. B. of A. Sealed proposals will be received until May 11 for fill, masonry, excavation, broken stone and gravel on Gulick-ave., Colerain twp., and until May 14 for the improvement of Werk road, Miami twp. Eugene L. Lewis, co. audt.

Indianapolis, Ind.—Sealed proposals will be received by the Board of Trustees of the town of Woodruff Place until May 20 for paving alleyways with brick on concrete base. Horace B. Hord, town clk.

CONTRACTS AWARDED.

Flint, Mich.—Bids were received, April 15, for brick paving, but the awarding of contracts was deferred.

Seattle, Wash.—The contract for improving Third-ave., Fourth-ave. and Union-st. has been awarded to M. Dow & Co. for $15,439.

Mason City, Ia.—The contract for brick paving and curbing was awarded to Frank McCann, Ft. Dodge, Ia., at $1.48 a square yard.

Schenectady, N. Y.—John Twomey was awarded the contract for paving Albany-st. with Catskill brick at $1.58 a square yard. Total, $23,177.

Galesburg, Ill.—The contract for 4,300 square yards of brick paving on Summer-st. has been awarded to John McAuley of this city for $5,471.

St. Joseph, Mo.—The contract for macadamizing, curbing, guttering and sewers on the Asylum road has been awarded to Helsley Bros. for $13,050.

Orange, Conn.—Robert Redfield & Son, New Haven, secured a contract for constructing 3,000 lineal feet of macadam road at 89 cents a lineal foot.

Holbrook, Mass.—J. S. Lane & Son., Springfield, were awarded a contract for macadamizing in Holbrook and Weymouth for $6,518.

Rochester, N. Y.—The contract for paving S. St. Paul-st. with Medina block was awarded to Whitmore, Rauber & Vicinus at $2.53 a square yard.

Roanoke, Ind.—A contract for paving Main-st. with brick and curbing was awarded, April 11, to Keefer & Bailey of Huntington, Ind., for $4,037.

Wheeling, W. Va.—McMahon, Porter & Co., New Cumberland, W. Va., were awarded a contract, April 9, for furnishing wire-cut brick at $7.50 per M. on cars.

Revere, Mass.—The contract for constructing 1,400 lineal feet of macadam road was awarded, April 7, to T. Stewart & Son of Newton for $13,496.

Keokuk, Ia.—The contract for furnishing 1,000 cubic yards of stone to be used in macadamizing the streets was awarded to Cameron & McManus at 77 cents a cubic yard.

Philadelphia, Pa.—Richardson & Ross were awarded the contract for resurfacing and repairing asphalt walks in Fairmount Park at 58 cents a square yard.

Columbus, O.—The contract for paving Toronto-st., from Twentieth to Trevitt, with Nelsonville block on stone foundation has been awarded to N. B. Abbott for $2,623.75.

Minneapolis, Minn.—The Alcatraz Asphalt paving company, San Francisco, Cal., has been awarded a contract for 30,000 square yards of asphalt paving for about $69,000.

Worcester, Mass.—The contract for furnishing the street department with supplies for the ensuing year has been awarded to Shaw & Carkin of North Chelmsford, Mass., for $27,125.

Wabash, Ind.—The Barber Asphalt Paving company was awarded the contract for paving Market, Canal and Wabash-sts. at $1.95 a square yard, with 5 cents per year additional for a five-year guarantee.

Augusta, Ga.—The contract for supplying 200,000 bricks was awarded to Hankinson & O'Keefe and the contract for macadamizing to W. F. Bowe for $13,000.

Newport, Ky.—The contract for furnishing 2,000 lineal feet of combined curb and gutter was awarded to the Chas. Kuhl Artificial Stone company, Cincinnati, for 63 cents a lineal foot.

Omaha, Neb.—The Iowa Brick company of Des Moines, Ia., secured the contract for brick paving, on sand and broken stone foundation, as follows: Center-st., $2.31 a square yard; Dodge-st., $2.36.

Ann Arbor, Mich.—The Alcatraz Asphalt company presented the lowest bid April 18 for paving Main-st. with asphalt, $25,164, and Wm. J. Clancy for paving it with brick, $20,414.70.

Berkeley, Cal.—The contract for grading and macadamizing Spruce-st. was awarded to W. J. Schmidt as follows: 5,500 cubic yards excavation, 29 cents; 9,000 cubic yards filling, 15 cents; 22,000 square feet macadam, 5 cents.

Binghamton, N. Y.—(Special.)—H. Ward says the contract for paving De Russey-st. was awarded to A. S. Webb, Syracuse, at $1.95 a square yard. Brick manufactured by the New York Paving Brick company will be used.

Albany, N. Y.—The contract for laying Kosmocrete walks and constructing driveways of ferolic artificial stone in Capitol Park has been awarded to the Vulcanite Paving company of Philadelphia for $47,460.

Racine, Wis.—The contract for paving Fourth-st., from Main-st. to Lake-ave., with cedar block was awarded to the N. F. Reichert Construction company at 87 cents a squard yard for paving and 57 cents for curbing.

Trenton, N. J.—The contracts for constructing a macadam road from Liberty-st. to White Horse and from White Horse to Crosswick's creek were awarded to Robert A. Montgomery of Lambertville for $19,750 and $2,475 respectively.

Atlanta, Ga.—The Warren-Scharf Asphalt Paving company presented the lowest bids for paving Auburn-ave., as follows: Trinidad asphalt on 4-inch concrete, 10-year guarantee, using new stone, $1.98 a square yard; using present stone, 5-year guarantee, $1.67.

Bluffton, Ind.—The Indiana Bermudez Asphalt company has been awarded a contract for twelve blocks of asphalt paving for $29,600.57. This price was $336 higher than the bid of the Warren-Scharf Asphalt Paving company, which will institute injunction proceedings.

Kansas City, Mo.—Paving contracts have been awarded as follows: Portion of Twentieth-st., M. Mense, Pittsburg brick, $1.37½ a square yard; total, $3,928. Smart-st., R. J. Boyd Paving and Construction company, $1.50; total, $7,365; asphalt, 4,600 square yards, Gilsonite Roofing and Paving company, $2.10 a square yard.

Newark, N. J.—John F. Shanley & Co. were awarded the contract for oblong granite block paving in Badger-ave., as follows: Paving, 11,500 square yards, $2.18; bridging, 2,000 feet, 47 cents; new 20-inch curb, 1,200 feet, 58 cents; old, 20-inch curb, 3,500 feet, 18 cents; corners, 3, $7 each; basin, 1, $85; total, $27,442.

Syracuse, N. Y.—The Empire Constructing company was awarded the contract, April 18, for paving Shonnard st., as follows: Excavation, 50 cents a cubic yard; asphalt, $2.08 a square yard; curb, 80 cents a lineal foot; headers, 60 cents; drain tile, 5 cents a lineal feet; catch basins, $80; 10-inch sewer pipe, 60 cents; vitrified brick pavement in R. R. strip, $2.03; track inlets, $25; total, $18,861.

Irvington, Ind.—The contract for paving Washington-st. was awarded to John Moore, as follows: From Wallace to Central, one mile, brick block, with combination curb and gutter and retaining wall next the street car tracks, $3,58 a lineal foot each side; east of Central-ave., macadam, one-third mile, John Moore, $2.24 a front froot each side using dressed limestone curb.

Cincinnati, O.—J. M. Quill secured the contract for macadam paving in McCormick Place, as follows: Broken stone, $1.20 a cubic yard; concrete, $3 a cubic yard; curbs, 49 cents a lineal foot; flags and lateral gutters, 65 cents a lineal foot; grading, 1 cent a lineal foot; rolling, 3 cents a square yard; gravel, $1.40 a cubic yard; asphalt repairs, $2 a square yard; headers, 15 cents a lineal foot; total, $1,152.

Denver, Col.—There was but one bid received for the asphalt paving on the Fourteenth-st. viaduct, that of the Denver Paving company, which was $1.45 a square yard for Alcatraz asphalt. The Trinidad lake, Bermudez and Grizzly Asphalt companies

have sent letters to the board of public works, protesting that the supecifications for the work were so drawn that one company only could bid.

Saginaw, Mich.—Bids were received, April 15, for furnishing cement, as follows: Portland cement, Remer Bros., Saginaw (Dyckerhoff), $3.15 a bbl.; (Atlas), $2.58; (Sandusky), $2.58; Cameron & Co., Port Huron, $2.59; Morley, Ewen & Co., Saginaw (Alpha), $2.63; (Alsen), $3.18. Hydraulic cement, Remer Bros., Saginaw (Obelisk), 65 cents a bbl.; Cameron & Co., Port Huron (kind not named), 88 cents; Morley, Ewen & Co., Saginaw (Milwaukee), 54 cents.

Waukesha, Wis.—The contract for paving Main-st. with brick, bids for which were received April 21, was awarded to Giovanni Maffioli of Rockport, Ill., at the following figures: Paving, $1.23 a square yard; excavation, 20 cents a cubic yard; new curb, 45 cents a lineal foot; protection, 20 cents a lineal foot; resetting curb, 5 cents; catch-basin covers and rebuilding, $10 respectively; lamphole covers, $2.25; cast iron gutters, $2.25 a lineal foot; cast iron gutter bridges, 45 cents; total, $23,869.55.

Rankin, Pa.—The contract for brick and stone paving was awarded to Chas. Rosser, Bellaire, O., as follows: 3,500 cubic yards grading, 31½ cents; 2,970 square yards stone paving on 8-inch gravel, 87 cents; 1,170 square yards brick on 6 inches gravel with 2 inches sand, 92½ cents; 2,000 lineal feet dressed curb, 45 cents; 245 lineal feet undressed curb, 30 cents; 1,500 cubic yards sidewalk grading, 31½ cents; 1,780 square yards brick sidewalks on 6-inch cinder foundation, 53 cents; total, $7,121.

Cleveland, O.—Contracts for brick paving were awarded as follows: Wade Park-ave., Northern Ohio Paving & Construction company, $41,905.90; Republic-st., Condon & Blossburg, $8,174.24; Holenden-ave., Brennan & Buettner, $10,449.80; Bell-ave., Brennan & Buettner, $7,331; Boston-ave., Cleveland Constructing company, $10,697.66; Oliver-st., Condon & Blossburg, $10,853; Kenilworth-st., Brennan & Buettner, $7,268.24; Cemetery-st., C. H. Burgess, $9,942; Plymouth-st., Brennan & Buettner, $647.27.

Pittsburg, Pa.—Booth & Flinn received contracts for paving six streets with asphalt at prices ranging from $1.45 to $1.55 a square yard. J. C. McSpadden was awarded a contract for paving Greenbush-st. with regular block stone at $1.64 and Prospect-st. with irregular block stone at 94 cents a square yard. Bids were received April 19 for a large amount of street work, in which, it is stated, the Pennsylvania Asphalt company will be the successful bidders on the greater part of the work.

Detroit, Mich.—The bids were opened April 22 for paving five down town alleys with Nelsonville, Metropolitan or Century brick. John A. Mercier & Co. presented the lowest bids on four of the alleys, $1,204.51, $767.69, $1,144.65 and $1,207.76 respectively, and Geo. W. Winterhalter was the lowest on one, $666.78. Thos. Kennedy secured the contract April 15 for furnishing the material for resurfacing worn spots on the boulevard pavement as follows: Limestone, $1.35 a cubic yard; granite, $1.59 a cubic yard.

Evansville, Ind.—Paving contracts were awarded as follows: Franklin-st., from Fulton-ave. to Bridge-st., 14,800 square yards, Bedford, Weikel & Nugent, Mack repressed brick, $1.59 a square yard; from Bridge to St. Joseph-ave., 30,000 square yards, Stinchfield & Saunders, $1.51; Bedford, Weikel & Nugent, Fulton-st., from First to Franklin, 20,300 square yards, Evansville brick, $1.54; from Maryland to Belt R. R., 11,100 square yards, Evansville brick, $1.48; Water, from Locust to Division, 5,800 square yards, Scioto brick, $1.24; Summer-st., from Chestnut-st. to Oak, 1,300 square yards, Scioto brick, $1.36½.

Buffalo, N. Y.—The contract for resurfacing portions of four asphalt streets has been awarded to the Barber Asphalt Paving company. This company was also the lowest bidder for repaving Niagara-st., from Niagara-square to Porter-ave., with asphalt as follows: Paving at its present width, $41,812; repaving two feet wider, $46,887; resurfacing at its present width, $33,097; resurfacing two feet wider, $38,452. The Barber company was the lowest bidder for repaving Lock-st., at $1,200, and the American Contracting company for repaving Dock-st., at $950, and W. Perry-st., at $779. The contract for repaving Jefferson-st. has been awarded to the Utica Paving company.

Macon, Ga.—Bids were received, April 12, for 20,000 square yards of brick and asphalt paving. The contract for brick paving was awarded to W. M. Laslie of the Chattanooga Brick company at $2.08 a square yard. The asphalt bids were not awarded, but left open until the next meeting of council. The asphalt bids received were as follows: Southern Asphalt company, Baltimore, 6-inch concrete, 1½-inch binder, 2-inch surface, $2.39 a square yard; 6-inch concrete, 2-inch surface, $2.18½; 4-inch concrete, 2-inch surface, $2.09. Warren-Scharf Asphalt Paving company, $2.20 a square yard. Bids for rock asphalt were received as follows: T. Hugh Boorman, New York City, $3.23 a square yard; Neuchatel Asphalt company, New York City, $3.31; Keilly & Co., Atlanta, Ga., $2.68; General Asphalt company, Baltimore, $2.98.

Utica, N. Y.—Bids received recently for asphalt paving in a number of streets showed an increase in prices over last year. The difference seems to arise from the higher prices on the auxiliary work, for paving last year was $2.25 and this year it is $1.94. Last year, however, the company allowed 86 cents per square yard for cobble and old cross-walk stones, while this year it allows but 6 cents. The city surveyor, in asking for bids for paving Court-st., based his estimates on last year's prices, which made it $28,000, but the bids received were over $39,000. The bids were tendered by the Utica Paving company and the Warren-Scharf Asphalt Paving company. New bids will be asked.

Indianapolis, Ind.—Paving contracts have been awarded as follows. New Jersey-st., from Twenty-second to Fall creek, asphalt, Indiana Bermudez Asphalt Company, $5.29 a lineal foot each side; Tenth-st., from Meridian to Pennsylvania, creosoted block, Hoosier Construction company, $2.43; Washington-st., Rural to Belt railroad, asphalt, Warren-Scharf Asphalt Paving company, $5.38; New Jersey-st., Sixteenth to Nineteenth, asphalt, Indiana Bermudez Asphalt company, $4.60; Market-st., East to Noble, creosoted block, Daniel Foley, $6.10; Ohio-st., East to Noble, asphalt, Western Paving and Supply company, $6.82; Fifteenth, Illinois-st. to Senate-ave., creosoted block, Hoosier Construction company, $3.49; Fifteenth-st., Central to College-ave., creosoted

block, $3.97. The contract for repaving Washington-st., from Alabama to Senate-ave., with asphalt was awarded, April 1, to the Western Paving and Supply company at $8.98 a lineal foot each side. Contracts for graveling were awarded, April 27, to J. H. Roberts at 25 cents and Geo. W. McCray & Co., $1.62½ a lineal foot each side. The latter contract includes cement sidewalks.

Ft. Wayne, Ind.—The contract for 42,000 sq. yds. of asphalt paving, for which bids were received April 25, was awarded to the Alcatraz Construction Co., at $1.60 a sq. yd.

SEWERS.

Madison, Wis.—The supreme court, April 18, denied the motion to place the injunction suit of D. K. Tenney vs. the city of Madison on the present calendar, thus carrying it over until fall. The suit is to prevent the carrying out of a contract for a new sewerage system.

Jacksonville, Fla.—The bond issue of $175,000 out of the $1,000,000 bond issue for the sewerage and drainage systems is practically expended and no further work will be done. The total of sewer mains laid is about 40 miles.

CONTEMPLATED WORK.

Chester, Pa.—Sewers will be constructed in a number of streets.

Waukon, Ia.—The construction of a sewerage system is contemplated.

New Hampton, Ia.—The question of constructing a sewerage system is being agitated.

Springfield, O.—Plans will be prepared at once for building sewers on the south side. D. L. Snyder, cy. engr.

Palo Alto, Cal.—Engineer Moore has been directed to prepare preliminary specifications for sewers.

Lakewood, O.—The question of issuing bonds for the construction of a sewerage system will be voted on.

Santa Monica, Cal—The plans and specifications for the second part of the outfall sewer have been adopted.

Cincinnati, O.—The annual report of the health officer recommends that Mill creek be inclosed in an immense sewer.

Tuxedo Park, N. Y.—The establishment of a sewage disposal plant is contemplated by the Tuxedo Association.

Great Falls, Mont.—The question of extending the main sewer in Sixth-st. is being considered. Mayor Fitzgerald.

Keokuk, Ia.—The construction of a sewer between Pine-st. and the bridge is contemplated by the council at a cost of $508.

Newark, N. J.—Ordinances have been passed for constructing sewers in Market and Black-sts. and Bloomfield-ave.

Toledo, O.—The state board of health will consider plans for main sewers in districts Nos. 28 and 33. W. F. Brown, cy engr.

Warrensburg, Mo.—The proposition to issue $8,000 worth of bonds for extending and completing the sewerage system will be voted on May 3.

Portland, Ore.—Notice of intention has been published to construct 12-inch terra cotta sewers in several streets. A. W. Gambell, audt.

Washington, Pa.—An ordinance has been passed for constructing sewers in numerous streets. The Waring system has been adopted.

Franklin, Pa. — The construction of about 3,000 feet of sewer extension is contemplated this summer. Thos. L. Kennerdell, cy. engr.

Goldsboro, N. C.—The question of constructing a sewerage system will be voted on in May. Maps and profiles have been adopted.

Winooski, Vt.—The question of issuing bonds for the construction of a sewerage system will be voted on May 3. F. T. Linsenmeier, prest.

Cambridge, O.—Ordinances have been passed for constructing sewers in Wheeling-st. and Steubenville-ave. P. C. Patterson, prest. coun.

Lasalle, Ill.—(Special.)—C. M. Rickard, cy. engr., says about two miles of sewers will be constructed. The contracts have not yet been awarded.

Lawrence, Mass.—The board of aldermen and common council have voted to authorize the loan of $75,000 in bonds for completing the Shanty Pond sewer.

Greensburg, Pa.—It is estimated the proposed Gas run sewer will require 570 perches of stone, 157,000 brick and 1,375 cubic yards of earth excavation.

Ames, Ia.—The immediate construction of a sewage disposal system is contemplated for the Iowa State College. Prof. A. Marston, engr. in charge.

Hintonburg, Ont.—The provincial board of health has approved plans for a sewerage system for this place. The question will be voted on May 3.

Bloomington, Ill.—The board of local improvements has decided to build an iron pipe sewer along the valley route. W. P. Butler, cy. engr.

Danville, Ill.—A resolution has been adopted directing the city engineer to prepare plans for the drainage of the northern part of this city.

Ft. Wayne, Ind.—The city engineer was directed, April 21, to prepare plans and specifications for constructing sewers in Barthold, Fourth and Andrews-sts.

San Diego, Cal.—The aldermen have adopted an ordinance authorizing the board of public works to purchase sewer pipe and extend the sewerage system. Simon Levi, prest.

Addison, Ill.—(Special.)—The construction of 1,400 feet of 6-inch pipe sewers is contemplated at Addison Seminary. August Weber, trustee; Geo. I. Herrick, engr., Wheaton, Ill.

Los Angeles, Cal.—An ordinance has been passed for the construction of 8-inch vitrified salt-glazed pipe sewers in four streets and a 12-inch sewer in Broadway. C. H. Hance, cy. clk.

Niagara Falls, N. Y.—Petitions have been presented to the board of public works asking for the construction of sewers on Buffalo and Pierce-aves. S. F. Arkush, cy. clk.

Pacific Grove, Cal.—The trustees have adopted resolutions of intention ordering the construction of 6-inch vitrified pipe sewers in three streets. E. B. Lewis, cy. clk.

Wilmington, Del.—J. B. Oberly, chrmn. finance com., has made application to council for an appropriation of $50,000 for the Silver Brook sewer and other improvements, including some paving.

Syracuse, N. Y.—The residents of the Tenth ward are considering a plan for constructing a large sewer, to extend from Gere's woods through Chemung-st. to the tracks of

the Auburn branch of the N. Y. Central, through Emerson-ave. and Canal-st. to the Marsh road or Hiawatha-ave., thence to Harbor Brook.

St. Paul, Minn.—Preliminary orders for the construction of new sewers were considered by the board of public works, April 14. The sewers will be constructed on Gaultier, Thomas, Lafond and Elfelt-sts.

Somerville, Mass.—The city council has adopted orders authorizing the sewer committee to solicit bids for the construction of branch sewers in Winter, Hill and Cross-sts, at a cost of $19,000 each. E. W. Bailey, cy. engr.

Massillon, O.—Plans and specifications for a sewage disposal plant for the Massillon State Hospital, to be used in conjunction with the sewers now under construction, are being prepared by Snow & Barbour, C. E., Boston.

Concord, Mass.—The question of constructing a sewerage system was favorably voted on at a town meeting held April 4. The system will cost $70,000. Wm Wheeler, Henry J. Hosmer, Woodward Hudson, sewer commissioners.

Vincennes, Ind.—The plans for a sewerage system, prepared by the Robert E. McMath Surveying company, St. Louis, Mo., have been adopted, but the city has no funds with which to carry on the work. Jas. L. Ener, Chas. O'Donnell, J. Kieffer, com.

Carlisle, Pa.—The sewerage system at the Cumberland county jail has been condemned by the board of health and the establishment of a new system is contemplated by the council. Alexander Potter, C. E., New York City, has furnished the council with data. Dr. S. L. Diven interested.

CONTRACTS TO BE LET.

Redfield, S. D.—Bids will be received until May 2, for constructing a sewerage system. J. S. Huston, cy. audt.

Alliance, O.—Bids are asked until May 11 for constructing certain sewers. J. H. McConnell, cy. clk.

Marion, O.—Bids will be received until May 23 for constructing a sewerage system. Cy. Engr. Overman.

Norristown, Pa.—Bids are asked until May 6 for constructing sewers in two streets. John C. Shanks, chrmn. com.

Yreka, Cal.—Bids are asked until May 3 for constructing a sewerage system north of Miner-st. U. F. Brown, clk.

Decatur, Ill.—Bids will be received in May for constructing 4,500 feet of 36-inch brick sewer. Ald. Geo. F. DeWitt.

Winona, Minn.—Bids will be received until May 9 for constructing an 8-inch pipe sewer on Fifth-st., from Huff to Harriet.

Green Bay, Wis.—Sealed proposals will be received until May 6 for constructing sewers and appurtenances. W. L. Kerr, cy. clk.

Cincinnati, O.—Sealed proposals will be received until May 21 for constructing a semicircular arch culvert on Northside-ave. Eugene L. Lewis, co. audt.

Waukesha, Wis.—Sealed proposals will be received until May 3 for constructing pipe sewers in Main and Pleasant-sts. and Arcadian-ave. Wm. Powrie, prest. B. P. W.

Dayton, O.—Bids will be received until May 2 for constructing a brick storm sewer along levee 9, as follows: 780 feet 72 inches, 1,440 feet 66 inches, 1,520 feet 60 inches, 10 manholes. J. E. Gimperling, cy. cont.

Cleveland, O.—Sealed proposals will be received until May 6 for constructing sewers in Fairview and Wade Park-aves. and Stoneman and Valley-sts. Bids will be received until May 21 for constructing sewers in two streets. Geo. R. Warden, dir. pub. wks.

CONTRACTS AWARDED.

Albany, N. Y.—Patrick H. Reilly secured the contract April 24 for constructing the McCarthy-ave. sewer for $1,918.30.

Chamberlain, S. D.—The contract for constructing a sewerage and water works system has been awarded to John W. Warnsheins of this city for $5,000.

Anaconda, Mont.—James Ryan, Butte, Mont., has been awarded the contract for constructing sewers in special districts 3 and 4 for $3,723.

Santa Monica, Cal.—The contract for constructing the outfall sewer and screen house was awarded April 13 to the Thompson Bridge company for $11,720.

Yonkers, N. Y.—The contract for sewer work in Orchard-st. and Chanfrau Place was awarded March 28 to Lawrence, Carroll & Co. for $2,218.49.

San Francisco, Cal.—Williams, Besler & Co. secured the contract for constructing the first section of the 6x6-inch brick sewer in the Sunset district for $15,000.

Madison, Wis.—The council has contracted with the American Sanitary Engineering company of Detroit for the construction of a sewage disposal plant for $37,200.

Oneida, N. Y.—The contracts for constructing 6,600 feet of lateral sewers on Sands and Elizabeth-sts. and Midlam-ave. was awarded to John Harris of Buffalo, April 20, for $11,500.

Milton, Mass.—Bids were received April 2 for sewer work from seventeen companies, ranging in price from $7,132, the bid of Cendella Bros., Milford, Mass., to $9,959, the bid of Long & Little of Leominster, Mass.

Vicksburg, Mich.—The Vicksburg Sewer company has been granted a franchise for constructing a sewerage system in this city. The company consists of Dr. W. W. Scott, president; Dr. F. S. Coller, secretary; E. T. Page, treasurer.

Milwaukee, Wis.—Chas. A. Mosher was awarded the contract, April 18, for constructing a sewer on Cold Spring-ave. and Mineral-st. as follows: 122 feet 30-inch brick sewer, $2.91; 1,373 feet 12 to 18-inch pipe sewers, 92 cents; total, $1,618.18.

Racine, Wis.—Bids were received April 9 for building a sewer in N. St. Clair-st. as follows: Fred Wilson, $1,148.91; P. B. Johnson, $1,095.29; Reichart Construction company, $1,167.85; Jas. Cape & Son, $1,178.98; John O. Jones, $1,101.69. All of the bidders are of this city.

Hudson, N. Y.—Bids were received April 6 for constructing a brick sewer in State-st., 2,890 feet long, as follows: John F. Shaughnessy, New York City, $8,996; Eugene Elkinburgh, Hudson, $9,650; Thos. Cruise, Hudson, $12,258; Shute & Rightinger, Hudson, $12,433.

Chicago, Ill.—Bids were received and contracts let, April 13, for constructing two sections of the Thirty-ninth-st. intercepting sewerage system as follows: Lawrence-ave., Farley & Green, $479,666.50; Thirty-ninth-st., Chicago Star Construction company, $786,591.

Allegheny, Pa.—The contract for constructing a sewer on Watson boulevard was awarded, April 12, to A. V. Purnell of this

city as follows: Two No. 1 inlets, $25; 900 lineal feet, 5-inch pipe, 85 cents; 600 lineal feet 9-inch pipe, 35 cents; four manhole shafts, $18; total, $1,097.

New Haven, Conn.—Sewer contracts were awarded April 14, as follows: Thos. A. Linahan—Wilson and Rosette-sts., $1,517.50; Sylvan-ave., $1,149. T. F. Maher—Rosette-st., $294.90: Fourth-st., $351.50; Goffe-st., $400; J. B. Whilby, Bond-st., $630; John E. Doolittle & Co., Liberty and Spring-st., $4,997.90.

Wheeling, W. Va.—Bids were received, April 9, for furnishing sewer pipe for the year 1898 as follows: Thos. A. Little, Wheeling, W. Va. Disct. off of carload rates. Single strength, 88½ per cent.; 15-inch D. S., 87½ per cent.; 18-inch D. S., 85½ per cent.; 20-inch D. S., 84 per cent.; 24-inch D. S., 82 per cent.; 30-inch D. S., 65 per cent., f. o. b. cars at Wheeling.

Waterbury, Conn.—The lowest bid presented for constructing 8,000 feet of pipe sewer was that of T. M. Lesher & Co. of Easton, Pa., which was as follows: 1,012 feet 15-inch pipe sewer, $1.37 a lineal foot; 1,079 feet 12-inch, $1.06; 600 lineal feet 9-inch, 92 cents; 2,900 feet 8-inch, 71 cents; 32 manholes, $37 each; total, $6,205.

Columbia City, Ind.—Bids were received April 7 for constructing the sewerage system. The lowest bid received for the sanitary system was that of E. Wood & Co. of Decatur, Ind., $22,984.90, and on the storm sewer system, O'Brien & De Hantz of Elwood, Ind., $23,643. The contract has not yet been awarded. Bids were received from eight companies.

Troy, N. Y.—Contracts for constructing two sewers were awarded April 12 as follows. Elm Grove-st., Frank Besh, $1.28 a lineal foot, and 30 cents a lineal foot for laterals; Fourteenth-st., William B. Eveline, 88 cents a lineal foot and 26 cents for laterals. George Harmon was awarded a contract for constructing a sewer in Hawthorne-st. as follows: 730 feet 12-inch pipe, $1.10; 180 feet 8-inch lateral pipe, 25 cents.

Chillicothe, O.—The lowest bid presented for the construction of the W. Second-st. sewer extension was that of Pfaff & Ringwald, as follows: Excavation, 30 cents a cubic yard; concrete, $4 a cubic yard; brick masonry, $6 a cubic yard; man-hole covers, $9; dirt pans, $1 each; man-hole steps, 25 cents each; laying sewer pipe, 20 per cent. off eastern list price; joining syphon to flush tank, $5; total, $638.58.

Cleveland, O.—Bids were received April 13 for constructing sewers as follows: Train-st.—Clements Bros., $7,828; Campbell Bros., $8,667; A. G. Hausman, $9,387; Cleveland Contracting company, $9,912. Junction-st.—Clements Bros., $7,120; Campbell Bros., $7,713; A. G. Hausman, $9,973; Cleveland Constructing company, $8,789. Watterson-st.—Clements Bros., $28,326; Campbell Bros., $21,901; Cleveland Constructing company, $28,334; J. Connelly & Son, $27,070.

WATER-WORKS.

Akron, O.—The circuit court made perpetual April 12 the injunction restraining the county and village officials from collecting taxes levied for the purpose of building a system of water works at Cuyahoga Falls.

Meadville, Pa.—The question of bonding the city to purchase the plant of the Meadville water company was favorably voted on April 7. The plant will cost $200,000.

Kansas City, Mo.—In accordance with the plans of Mayor Jones and other city officials, the water rates will be reduced fully 20 per cent. and perhaps 25 per cent.

Columbus, O.—The plans for the water works storage dam and conduit were submitted to the state board of health April 20. The board discussed the plans informally, but took no action.

Visalia, Cal.—An agreement has been reached whereby the Visalia City Water Company will be given possession of the water works, free of indebtedness, and the recently initiated litigation ended.

McPherson, Kas.—Z. L. Wise has been appointed receiver of the McPherson water works by the federal court at Wichita, due to the foreclosure of a mortgage held by eastern parties.

Gadsden, Ala.—The city council has annulled the contract held by the Gadsden Water Works company and given it twelve months in which to remove its mains from the street. The failure of the company to live up to the requirements and terms of the contract is the reason assigned for the city's action. The company has instituted suit for $10,000.

Brooklyn, N. Y.—A plan for increasing the water supply of the boroughs of Brooklyn and Manhattan is being prepared by the engineers of the department of water supply. It consists of the construction of a tunnel under the East river for the purpose of connecting the Croton and Ridgewood water systems and the increasing of the supply of the Croton system by an amount sufficient to furnish an abundance of water for Greater New York for several years.

CONTEMPLATED WORK.

Du Bois, Pa.—An order has been adopted to lay 1,100 feet of 8-inch pipe.

Gallatin, Ill.—Surveys and estimates are being made for a water works system.

Mankato, Minn.—The extension of water mains is contemplated by the council.

Ely, Minn.—This town has voted to complete the water works and erect a standpipe.

Ottumwa, Ia.—A 30,000-gallon reservoir will be constructed and water mains laid in a number of streets.

Greenville, Ill.—The erection of a standpipe in connection with the city water works is contemplated by council.

Frederick City, Md.—This city has voted to issue $35,000 bonds for increasing the water supply.

Monticello, Ark.—The purchase of an air compresser and boiler for the proposed water works is contemplated. E. B. Windes.

Parnassus, Pa.—Plans are being prepared for the proposed water works and bids will be asked soon. E. D. Cree, boro clk.

Pine Island, Minn.—This town desires to correspond at once with civil engineers regarding plans for a water works system.

New Castle, Ind.—The purchase of a 3,000,000 gallon compound condensing engine is contemplated this spring. E. M. Carr, mgr. w. w.

Schenectady, N. Y.—The bill authorizing this city to raise a loan of $97,000 to improve its water system has been signed by Governor Black.

Cold Spring Harbor, N. Y.—A private company proposes to erect water works. No contracts have been awarded yet. Chas. H. Davis interested.

Bradford, Pa.—The building of a 100,000,000 gallon reservoir is contemplated and bids will probably be asked in June. S. D. Heffner, supt.

Pueblo, Col.—Plans for increasing the water supply will be made by John W. Hill, C. E., of Cincinnati, O., who will be assisted by E. W. Hathaway, cy. engr.

Salina, Kas.—This city has voted to have municipal water works, but it is undecided as yet whether to purchase the plant of the Salina Water Works company or build a new system.

Corona, Cal.—The installation of a pneumatic pumping plant is contemplated by T. P. Drinkwater, Elwood Lilly and others of the Temiscal Water Works, according to press reports.

The question of bonding for water works has been favorably voted on at the following places: Yale, Mich., Minden, Ia.; Hyattsville, Md., May 2; Lumpkin, Ga.; Bloomville, O.; New Vienna, Ia.

Denver, Col.—An ordinance is said to have been signed by the mayor appropriating $5,000 to the city engineer's department for the preparation of plans and specifications for a municipal water works plant.

The question of water works construction is being agitated at the following places: Attica, N. Y.; Valley Junction, Ia.; Cold Spring Harbor, N. Y.; Colesburg, Ia.; Van Alstyne, Tex.; Pratt City, Ala.; Versailles, O.

Oil City, Pa.—The board of water commissioners contemplates installing one 300,000,000 gallon vertical compound or triple pumping engine, or two 1,500,000 gallon power pumps, and four 50 H. P. gas engines. A. M. Breckenridge, clk.

The question of issuing bonds for water works construction will be voted on as follows: Tucson, Ariz., May 5; Gallatin, Tenn.; Bristol, Ind.; Breckenridge, Col.; Pine Island, Minn.; Kirksville, Mo.; May 3; Columbus, Miss., May 12; Hyattsville, Ind., May 2.

Allegheny, Pa.—The department of public works has received an appropriation of $605,765.56 for prosecuting city work, of which $252,819.82 will be employed by the bureau of water supply in operating the pumping plants and the extension of the water distributing system.

The construction of water works systems is contemplated at the following places: Winthrop, Ia.; Montevallo, Ala.; Williamsburg, Ky.; Groton, Conn.; McConnellsville, O.; Oxford, Ia.; Lakeview, Ore.; Smithsburg, Md.; Clinton, Ia.; Winnipeg, Man.; Elmore, Minn.; Wimbledon, Minn.; Greenwich, O.; Palestine, Tex.; Williamsburg, Mass.

Fitzgerald, Ga.—(Special.)—C. C. Goodnow, mayor, says: "The bonds of the city in the sum of $33,000 for the construction of water and lighting plants were sold to F. M. Stafford & Co. of Chattanooga for $1,700 premium. The work on the artesian well is progressing satisfactorily and the work of receiving bids for the construction of the water and light plants will soon be in order. The city will own its plants and nothing but first-class work or material will be accepted."

CONTRACTS TO BE LET.

Spokane, Wash.—Sealed bids will be received until May 12 for enlarging the present pumping station and furnishing and laying a 24-inch steel force main. B. H. Fowle, sec. B. P. W.

Calhoun, Ga.—Bids will be received until May 6 for constructing a water works system. W. L. Hillhouse, mayor.

Santa Ana, Cal.—Bids are asked until May 2 for constructing a complete pumping plant. Ed Telford, cy. clk.

Ridgewood, N. J.—Sealed proposals will be received until May 25 for constructing water works system. H. G. Ward, vil. clk.

Lebanon, Pa.—Bids will be received until May 2 for furnishing water pipe, hydrants, etc. J. D. Kerr, secy. bd. water comrs.

Grove City, Pa.—Sealed proposals will be received until May 4 for constructing a system of water works. C. W. Forest, prest. coun.

Marshall, Mich.—Bids will be received until May 18 for laying about 9,500 feet of 6-inch water mains, etc. P. S. Joy, supt. water bd.

Corning, N. Y.—Sealed proposals will be received until May 2 for extending the water mains across the river, a distance of 1,940 feet. S. T. Hoyt, Jr., cy. engr.

Mitchell, S. D.—Sealed bids will be received until May 2 for laying 432 feet of water mains. J. K. Smith, cy. audt.

Hallowell, Me.—Bids will be received until May 15 for the following: Laying 18,000 feet 6-inch, 6,000 feet 8-inch and 1,500 feet 12-inch water pipe; setting gates, hydrants and excavating rock. Fred Emory Beam, clk. water comrs.

Albany, N. Y.—Bids are asked until May 17 for constructing water filtration plant, contract No. 5, consisting of two pumping engines. Bids will be received until May 3 for furnishing 300 gross tons of cast iron water pipe and 10,000 pounds of special castings. Geo. I. Bailey, supt. w. w.

BRIDGES.

Marysville, Mo.—Contracts will be let, May 6, for six bridges. Jas. K. Young, bridge comr.

Davis, Minn.—Bids will be recommended until May 10 for building three bridges. Town supervisors.

Elkton, Md.—The county commissioners will open bids in May for a new iron bridge near Perryville.

Columbus, O.—Plans have been submitted for a new steel bridge over Alum creek on E. Main-st.

Mackinaw, Ill.—This town has voted to borrow $2,000 to build a new bridge across the Mackinaw.

Shreveport, Ia.—Bids are asked until May 12 for building two bridges. P. Youree, prest. police jury.

Kingston, Mo.—Bids will be received until May 2 for the construction of an iron bridge over Otter creek. Dave Stucke, co. surv.

Forman, N. D.—Bids will be received until May 18 for constructing a bridge across Wild Rice creek. A. N. Cariblom, co. audt.

Red Wing, Minn.—The council has been urged to take some action toward constructing a new bridge across the Wisconsin channel.

Utica, O.—The county commissioner has decided to replace the old wooden bridge south of town with a steel structure.

Leavenworth, Kas.—Bids are asked until

May 4 for constructing a bridge across Three Mile creek. M. A. Przybylowicz, cy. clk.

Elyria, O.—Bids will be received until May 2 for erecting a stone arch bridge across Black river. G. H. Lewis, co. audt.

Mt. Vernon, O.—Bids are asked until May 12 for building an iron bridge over the Kokosing river, at Millwood. A. W. Wander, co. audt.

Cohoes, N. Y.—The Wrought Iron Bridge company, Canton, O., has been awarded a contract for the construction of a bridge at Dunsbach's Ferry.

Hillsboro, N. D.—Bids will be received until May 24 for constructing two combination bridges and one steel bridge. Geo. O. Stommer, co. audt.

Bottineau, N. D.—Bids will be received until May 16 for building a bridge across the Mouse river at Scotia. Geo. J. Coulthard, co. audt.

Madison, Neb.—Bids will be received until May 4 for the construction of a bridge across the Elkhorn river, one mile north of Meadow Grove. E. G. Heilman, co. clk.

Hereford, Md.—The county commissioners are considering a petition for a 115-foot span iron bridge over the Big Gunpowder river at Massamore's Mills.

Carrollton, Ga.—Bids are asked until May 3 for building a bridge across Rowe's Millcreek on Carrollton and Temple road. S. J. Brown, ordinary.

Jersey City, N. J.—Bids will be received until May 5 for constructing a steel bridge over the Morris and Essex canal at Pacific-ave. Bd. Freeholders.

Spokane, Wash.—Bids are asked until May 12 for building a bridge across the river for carrying a 24-inch force main. B. H. Fowle, secy. B. P. W.

Mascoutah, Ill.—The proposition to build a steel or iron wagon bridge across the Kaskaskia river, at Cox's ferry, has been favorably voted on; estimated cost, $10,000.

Gonzales, Tex.—Bids will be received until May 11 for the construction of an iron, steel or wire bridge across the San Marcos river at Slayden. W. W. Glass, co. judge.

Ellendale, N. D.—Bids will be received, accompanied by plans and specifications, for building wood, combination or steel bridge across the James river. S. V. Saunders, co. audt.

St. Paul, Minn.—The board of aldermen passed a preliminary order April 19 providing for the construction of the new Raymond-ave. bridge. It will be a steel bridge of two spans.

New Whatcom, Wash.—Bids will be received until May 3 for the construction of a 200-foot fixed combination bridge across Noosack river, on the Guide Meridian road. Alex Van Wyck, co. audt.

Wapakoneta, O.—Sealed proposals will be received until May 3 for constructing a steel bridge on stone abutments across the St. Marys river, in the town of St. Marys. G. A. Orphal, co. audt.

Easton, Md.—Bids will be received until May 12 for building one iron bridge over Choptank river, at Dover bridge, between Carolina and Talbot counties. Thos. R. Green, clk. Carolina co. comrs. Chas. F. Stewart, clk. Talbot co. comrs.

Cincinnati, O.—Sealed proposals will be received until May 21 for the construction of two bridges over Muddy Creek on Muddy creek road, Green township. Bids will be received until May 4 for a temporary bridge over Miami river, at New Baltimore. Eugene L. Lewis, co. audt.

PARKS.

Oxford, Ia.—The question of creating a public park is being considered.

Newton, Kas.—This city has begun work on a system of parks. It is proposed to improve three parks at considerable expense.

Cleveland, O.—The board of park commissioners will ask the general assembly for an issue of $1,000,000 in bonds for the improvement along the Cuyahoga river and lake front. J. H. McBride and L. E. Holden, park commissioners.

Chicago, Ill.—Arrangements were completed April 21 for a series of improvements in the West Park system, the principal one of which will be the completion of the center drive in Southwest boulevard, connecting the west and south park system. A granolithic sidewalk will be laid around Douglas park, on California-ave., and Oakley and Hamlin-aves. will be paved with asphalt.

Quincy, Ill.—(Special.)—E. J. Parker, president of the Quincy Boulevard and Park association, submitted a report April 15 showing the progress made in the development of a park system for Quincy. Through the efforts of the association there has been thrown open to the citizens of Quincy in the last ten years 115 acres of municipal pleasure grounds on an annual appropriation of $1,000. During this period the city's bonded indebtedness has been reduced from $1,728,100 to $1,285,400. He urges a larger allowance for park purposes. The association during the last year brought about the construction of a Telford road on Locust-st., now called Locust boulevard. The entire cost of this road, one mile in length, sixteen feet wide, was $3,200, the money being raised by appropriations and subscriptions of benefited property-owners and interested citizens. The enterprise proved very successful and arrangements have been made for the construction of another similar road.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Gloucester, Mass.—The question of building a garbage crematory is being considered.

Montclair, N. J.—An appropriation of $7,000 for garbage disposal has been voted.

Reading, Pa.—The purchase of several street sweepers is said to be contemplated by the board of public works.

Williamsport, Pa.—A resolution has been referred to the highway committee to sweep the streets by hand.

Mankato, Minn.—Street sprinkling contracts were awarded, April 9, to Wm. Page at 14 cents per 100 feet per week.

Weigeltown, Pa.—A garbage disposal will be constructed this spring by Louis Kaufman on his farm.

Atlanta, Ga.—The council is considering a resolution to use $10,000 of the city funds for building a new crematory.

Niles, O.—The business men of Main-st. contemplate the purchase of a street sprinkler for use on that thoroughfare.

Pueblo, Col.—The Women's Improvement Association has asked the council to take some decisive steps toward keeping the city clean

Newport News, Va.—Bids are asked until May 14 for collecting and removing the night soil of this city for one year. J. A. Massie, cy. clk.

Braddock, Pa.—A proposition to dispose of this city's garbage has been made by Wesley Richardson of North Braddock. Wm. Yost, boro solicitor.

Atlanta, Ga.—It is probable that the style of street sprinkler which is now used will be changed, owing to the flooding of the streets with too much water.

Scranton, Pa.—The Dunn Sprinkling and Street Cleaning company, has been incorporated by J. A. Dunn, Y. M. Hallstead, B. D. O'Riley and J. A. Dunn, of this city.

Jersey City, N. J.—The McKay Crematory Construction company has been incorporated by Kevin W. Barry of Bayonne, N. J., and Geo. A. Tracy and John Farley of New York City.

Buffalo, N. Y.—The commissioners have recommended that the contract for the destruction of garbage be awarded to Grattan & Jennings for five years for a total of $79,200.

Indianapolis, Ind.—Contracts for sprinkling certain unimproved streets were awarded April 27 as follows: Districts 15 and 18, F. W. Nolting, $26.50 for each 10,000 square feet; district 18, Henry T. Nolting, $27; district No. 22, Frank Kennington, $25.

St. Paul, Minn.—In awarding contracts for sweeping asphalt streets, April 9, the board of public works decided not to recognize any bids under $6 per week, and to not award them to men who were physically unable to do the work. The prices at which the awards were made ranged from $6 to $6.95. The following were the successful contractors: P. Beyer, M. Larkin, M. Herman, B. Danneker, F. Horeish, P. Gilze, J. Jande, P. Washingbergen, Lars Alen, A. Beck, John Duede, F. Ullman, Pat Larkin, M. Kush, A. Kirchoff, J. Leopold, Joseph Gartner, M. Zandl, C. Behr, W. Fastner, H. Gerner, F. Holenberger, Pat Downey, N. Lentsch, F. Payen, P. Doolan, G. Johnson, P. Klein, W. Lehmann, Joseph Nowak. The street sweeping force will wear white uniforms.

TOO LATE FOR CLASSIFICATION.

Oswego, N. Y.—The Warren-Scharf Asphalt Paving Co. presented the lowest bid for paving seven streets with asphalt, aggregating 33,195 sq. yds. This company's bid was $1.95 per sq. yd. for heavy pavement, $1.80 for light pavement, and from 74 to 80 cts. per lin. ft. for curbstone.

Pittsburg, Pa.—Director Bigelow awarded over seventy contracts for street repaving April 21. The contracts for asphalt paving were awarded to the Alcatraz Asphalt Paving Co., J. C. McFadden, Evan Jones and the Pennsylvania Asphalt Co., at $1.37 a sq. yd., the lowest bid ever made in the city. Booth & Flinn secured the contract for block stone paving.